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AdaNET Executive Summary

R. Michael Digman
MountainNet, Inc.

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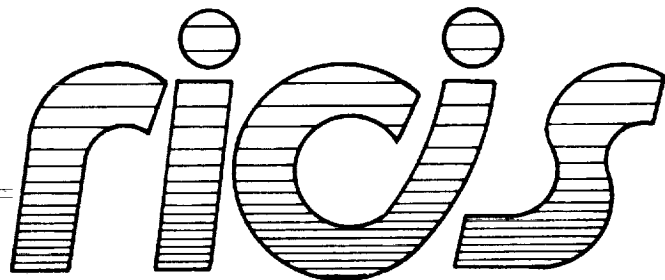
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August 1988

Cooperative Agreement NCC 9-16
Research Activity No. SE.18

NASA Headquarters
NASA Technology Utilization Program



Research Institute for Computing and Information Systems
University of Houston - Clear Lake

T · E · C · H · N · I · C · A · L R · E · P · O · R · T

The RICIS Concept

The University of Houston-Clear Lake established the Research Institute for Computing and Information systems in 1986 to encourage NASA Johnson Space Center and local industry to actively support research in the computing and information sciences. As part of this endeavor, UH-Clear Lake proposed a partnership with JSC to jointly define and manage an integrated program of research in advanced data processing technology needed for JSC's main missions, including administrative, engineering and science responsibilities. JSC agreed and entered into a three-year cooperative agreement with UH-Clear Lake beginning in May, 1986, to jointly plan and execute such research through RICIS. Additionally, under Cooperative Agreement NCC 9-16, computing and educational facilities are shared by the two institutions to conduct the research.

The mission of RICIS is to conduct, coordinate and disseminate research on computing and information systems among researchers, sponsors and users from UH-Clear Lake, NASA/JSC, and other research organizations. Within UH-Clear Lake, the mission is being implemented through interdisciplinary involvement of faculty and students from each of the four schools: Business, Education, Human Sciences and Humanities, and Natural and Applied Sciences.

Other research organizations are involved via the "gateway" concept. UH-Clear Lake establishes relationships with other universities and research organizations, having common research interests, to provide additional sources of expertise to conduct needed research.

A major role of RICIS is to find the best match of sponsors, researchers and research objectives to advance knowledge in the computing and information sciences. Working jointly with NASA/JSC, RICIS advises on research needs, recommends principals for conducting the research, provides technical and administrative support to coordinate the research, and integrates technical results into the cooperative goals of UH-Clear Lake and NASA/JSC.

AdaNET Executive Summary

Preface

This research was conducted under the auspices of the Research Institute for Computing and Information Systems by MountainNet, Inc., under the supervision of R. Michael Digman. Peter C. Bishop, Director of the Space Business Research Center at the University of Houston-Clear Lake, served as RICIS technical representative for this project.

Funding has been provided by the NASA Technology Utilization Program of NASA Headquarters through Cooperative Agreement NCC 9-16 between NASA Johnson Space Center and the University of Houston-Clear Lake. The NASA technical monitor for the activity was Roy Bivins, Manager, Information & Network Operation Technology Utilization Division, NASA Headquarters, Washington, D.C.

The views and conclusions contained in this report are those of the author and should not be interpreted as representative of the official policies, either express or implied, of NASA or the United States Government.

AdaNET Executive Summary

MountainNet, Inc. is researching and developing AdaNET in response to the needs of the United States industrial base. This NASA and DoD co-sponsored initiative will combine the strengths of software engineering and Ada technology.

The US Department of Defense recognized that proliferation of computers and resultant software was requiring an unacceptable level of funding and other resources to field and reliably maintain critical defense systems. In response to this, the Ada language was developed and introduced. Ada has achieved a successful introduction in the defense and space community. However, experts in the field of software engineering have recognized the applicability of Ada in the commercial sector; most notably in process control applications, factory automation techniques, communications and management information systems.

The goal of AdaNET is to transfer existing and emerging software engineering technology from the federal government to the private sector. As a change agent introduced into the infrastructure of US industry, AdaNET will provide a distributed information base on software engineering and Ada as well as a library of reusable software.

Reautomation is essential to maintain US industrial competitiveness in the global marketplace. AdaNET's key service will be to significantly aid this process. First, the AdaNET Information Services will provide users with insight into the Ada community and its related software engineering technology. This will be accomplished through value added information services detailing training opportunities, government initiatives, technology breakthroughs and marketplace information. Additionally, AdaNET will act as an automated "clearinghouse" gateway into other information sources. Second, the Dynamic Software Inventory will contain software "profiles" and "parts" which can be used to build a portion of, or an entire, software subsystem. Significantly, these components will be part of an entire software lifecycle inventory which will include requirements statements, software architecture design and component, or part, detailed design. Such documentation is extremely important in order for software reuse to be effective.

Creating the environment to promote good software engineering practices is a key ingredient to AdaNET. Beginning with the existing Ada community, AdaNET will reach out to the U.S. business and manufacturing communities. This change agent function will serve to speed up the transition of technology and enhance the ability of U.S. industry to integrate factory floor, management information and distribution systems.

AdaNET is being designed and implemented by MountainNet, Inc., a West Virginia based software engineering and communications company. Funding is being provided by the NASA Technology Utilization Division and the DoD Ada Joint Program Office, through the Johnson Space Center, under subcontract to the University of Houston - Clear Lake. Support for the program is being provided by NASA's Technology Utilization Division, the DoD Ada Joint Program Office, the Department of Commerce, Office of Productivity, Technology and Innovation, and the DoD Department of the Army.

AdaNET is an important part of U.S. industry, as a technology transition mechanism, a change agent, and a resource for manufacturing reautomation.

Disclaimer Notice

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies or recommendations of the Technology Utilization Division of the National Aeronautics and Space Administration, the Ada Joint Program Office of the U. S. Department of Defense, or the Office of Productivity, Technology and Innovation of the U. S. Department of Commerce.

Overview

This is MountainNet, Inc.'s final research report for The Initial Study of the Feasibility of Expansion and Commercialization of an Ada Technology Transfer Network and Implementation of Such a Network. It is the culmination of efforts to describe the operational components of AdaNET. The National Aeronautics and Space Administration Technology Utilization Division and the Department of Defense Ada Joint Program Office, through the Johnson Space Center, are supporting this technology transition initiative, under the direction of the the University of Houston-Clear Lake. All participating government agencies look to use AdaNET in helping to extend software engineering and Ada technology beyond the aerospace and defense industries, out to US business and manufacturing communities.

As the initial feasibility study of the commercialization of AdaNET as an Ada Technology Transition Network, with plans for implementation of this network, this report details those components necessary for success. The objective of UHCL's Research Institute for Computing and Information Sciences (RICIS) was to "obtain a comprehensive plan for organization and operation of an Ada technology transfer activity which, within a reasonable time, has a high probability of being self supporting and which will effectively promote the increased utilization of Ada in commercial applications."

This report is the culmination of a two-phase research activity, with phase III, continuing research in lifecycle library design and first stage services implementation, being subject to future funding availability.

This report was prepared by MountainNet, Inc., a software engineering and communications company located in Morgantown, WV. MountainNet recommends that additional funding be set aside to phase-in the AdaNET service over time. During the initial funding period for implementation, MountainNet will track revenues versus expenditures, with in-depth evaluation of resources utilization and user activity in specific services areas, so as to more clearly identify when the AdaNET service can become totally self supporting.

This report contains:

Organizational Views A report which specifies the desires and views of co-sponsoring organizations and potential AdaNET users;

Organizational Plan This report presents the planned organizational structure for services development and technology transition of AdaNET services to potential user communities;

Business Plan The plan to operate the AdaNET service as a commercial venture;

Technical Plan The plan from which the AdaNET can be designed, including detailed requirements analysis;

Analysis of User Fees and Charges and Proposed Fee Schedule

Organizational Documents The documents necessary to operate the AdaNET service on a commercially self-supporting basis. These include license agreements, nondisclosure agreements and others.

DRAFT

**Final Report
For The
Initial Study of the Feasibility
of
Expansion and Commercialization
of an
Ada Technology Transfer Network
and
Implementation of Such a Network ©**

August 2, 1988

**Subcontract No. 002
Cooperative Agreement NCC9-16
Project No. RICIS No. SE. 18**

**Submitted to:
University of Houston - Clear Lake
2700 Bay Area Boulevard
Houston, TX 77058-1096**

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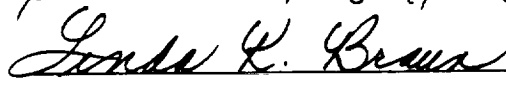
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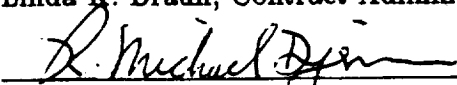
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**Submitted to:
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Chapter 1

AdaNET Organizational Views

1.1 AdaNET Project Report

This report summarizes the views and perspectives of the current AdaNET project participants. These participants, and the affiliated organizations identified with them include:

National Aeronautics and Space Administration (NASA) Technology Utilization Division

- *Computer Software Management and Information Center (COSMIC)*
- University of Georgia, GA
- *High Technologies Laboratory*
- University of Houston, Clear Lake, TX
- *NASA Industrial Applications Center (NIAC)*
- University of Pittsburgh, PA
- *NASA Technical Applications Team*
- Research Triangle Institute, NC

Department of Commerce (DOC)

- *Office of Productivity, Technology and Innovation (OPTI)*

Department of Defense (DOD)

- *Ada Joint Program Office (AJPO)*

Beckley College
Beckley, WV

West Virginia University/WVU Research Corporation Morgantown, WV

The information in this report is based on the discussions that have been held with these organizations since the beginning of the project on October 12, 1987. During the latter part of October and November, regular meetings were

held with the participating NASA offices and affiliated organizations, DOC offices and with the AJPO. (See Attachment A for a complete list of meetings). These meetings culminated in a series of meetings held on November 16 and 17, with an *ad hoc* planning meeting held on the 17th that included all of the charter project participants.

This report contains the following sections:

- Each participant's views concerning:
- Long and short term goals for AdaNET
- Organizational structure
- Resources and returns.
- Summary of identified AdaNET services.
- Summary of the organizational model currently under discussion by the NASA TU, DOD AJPO and DOC OPTI with the AdaNET developers.

Due the extreme diversity of these groups, and the current levels of commitment of the key individuals in these organizations, these discussions have been limited in number and scope. As a starting point, this report summarizes the AdaNET project team's understanding of the participant's initial views. As discussions mature, these views will migrate into defined and mutually agreed and accepted AdaNET organizational structures, teaming relationships, and a more focused understanding of how these complex interdisciplinary interrelationships will combine to strengthen the development of AdaNET.

1.2 Participant's Views

1.2.1 Ada Joint Program Office

Initially, AdaNET will develop a facility that provides commercial access to the software and information that is available on the Army's SIMTEL-20 Ada Software Repository. This access should be provided via telecommunications, hard-copy and electronic media access. As the project matures, there is a need for the development of value added services to the software repository activities, such as measure for verification and validation, metrics, and an improved organizational structure of repository materials. Cost recovery measures need to be developed to allow the facility to establish a base of independent operation within a three to five year period. Included were discussions of the on-going support for the Ada community provided by AdaNET through its network of value-added functions in the areas of education, training, and identification of developing Ada technology resources. Over the longer term, AJPO may utilize the multiple network linkages that will exist through AdaNET to provide solutions to other needs identified by the AJPO; such network utilization might include establishing the Ada Information Clearinghouse bulletin board as a node available through AdaNET's front-end commercial network access, rather than through long distance dial-up numbers; no or very low cost telecommunications commercial access to the Defense Data Network's Ada users accounts host system at the Software Engineering Institute (SEI); linkage of other repositories with AdaNET that are operated by various activities within the DOD. The AdaNET will become a node for Ada information, services and software, in the greater network that is being defined by the AJPO.

AJPO will provide financial support for AdaNET through Y88. No determination has been made as to financial commitments beyond that point. Additionally, the AJPO will continue to provide support to network AdaNET with the existing Ada community, and to help keep AdaNET focused on those areas that it sees are essential for the continuing development and proliferation of Ada in the commercial and governmental sectors.

While no preferred organizational structure for the actual AdaNET facility has been specified by the AJPO, discussions have been focused on the for-profit model for its implementation. More importantly, the need for establishing organizational structures and policies for the interaction of various participating organizations has been recognized. Additional questions as to how new organizations may participate at various levels within AdaNET is another area of keen interest to the AJPO. Such questions need to be addressed prior to the

introduction of new members to these boards, and particularly the Board of Governors. One basic question to be addressed concerns additional activity on the part of other DOD organizations with AdaNET, and how that participation should be coordinated with respect to the AJPO, considering the AJPO's catalyst role within the DOD. A major organizational meeting of NASA, AJPO, DOC and AdaNET development team leaders is planned for December 10, 1987 following the AdaEXPO in Boston, at which time some of these questions should be resolved.

1.2.2 DOC Office of Productivity, Technology and Innovation

OPTI sees a great need for the development of a base of Ada software and technology that can be applied to industrial automation and Flexible Computerized Manufacturing (FCM). OPTI hopes to see Ada technology utilized in the implementation of such systems, since the DOD's concerns for fault tolerant, reliable embedded systems that can be developed and maintained at the lowest possible cost, are shared by the commercial sector. AdaNET must have an applications focus, rather than a research orientation. Successful use of resources available through AdaNET will depend on continuing support services to aid individual companies in applying that technology to their specific applications. Types of support identified by OPTI as necessary include: help in selection of computer hardware and software development tools that are best suited for specific applications development, and access to continuing support and expertise for companies transitioning to the use of automation technologies. Such support is critical for large scale transition to automation technology by the American industrial base; without it, those industries lacking their own internal capabilities will be unable to utilize existing technology.

AdaNET needs to develop a basis for cost recovery, so that its operation becomes one of commercial self-sufficiency. This basis should be established through a for-profit entity due to the extreme emphasis on industrial marketing and commercial interaction that is an integral part of AdaNET services development. Aggressive technology transfer activities, if undertaken by a non-profit entity, could be seen as a base of unfair competition with the commercial sector. Therefore, the for-profit model, supported by strong linkages with educational institutions and other commercial sector entities, is the preferred structure emerging from OPTI.

OPTI has concern about the names and wording of statements of mission and goals for the various organizational boards that have been currently defined;

these include the Board of Governors and the Technology Advisory Board. Their concern focuses on:

- The question of whether members of government agencies may sit on panels with regular attendance of commercial sector representatives, and
- The need for specific recognition that these governmental representatives are in no way sitting on a corporate board of a commercial entity, and hence directing the activities of a commercial entity as part of their governmental representation; rather, that they are members of a board providing steering and oversight for a government funded project.

OPTI will continue to provide the types kinds of in-kind services as identified in the AdaNET proposal. These services include: analytic, informational, and networking services, including organizational and business plan assessments. OPTI will give valuable assistance in defining an organizational structure that will not be vulnerable to anti-trust violations. OPTI will also provide networking functions for AdaNET with commercial sector entities that are identified as either potential participants in the AdaNET cooperative, or potential users of AdaNET services. Such organizations may migrate into AdaNET through either the Technology Advisory Board or the Business and Industry Council.

1.2.3 NASA Technology Utilization Division

NASA's TU division has provided the leadership in establishing the AdaNET project. In addition to its financial support, many TU affiliate organizations will participate and contribute from their individual areas of expertise. This broadened base of support and diversity of resources will serve to both strengthen AdaNET's development, and enhance the scope of technical, information, and consultant resources that will be provided by AdaNET to its end users.

In discussions with NASA and affiliate organization representatives, the following determinations have been made; AdaNET must be a multi-faceted service organization:

- AdaNET cannot be just another bibliographic database system, or static repository system, or just another network joining the hundreds of networks that already exist.
- AdaNET must, in all areas, provide value-added services that not only will allow it to fill a gap that exists for value added software and information

relating to Ada technology, but also will enhance the value of the many existing software and informational systems, by providing node access to those third party services identified.

In this way, AdaNET will provide a much higher base of potential users to those services that might previously have been standalone in function. The value attached to accessing AdaNET will be greatly increased by making available additional bases of information that were not developed by AdaNET, but that are offered as part of the total pool of resources available.

It is essential to make some AdaNET services commercially available during 1988, with at least low-level value added functions applied to that software, such as initial taxonomic organization, flexible user interfaces, software system verification (similar to the verification done by COSMIC on its software modules), and documentation and tutorials for the re-construction and use of those software systems that are offered. Additionally, informational and educational services need to be provided, so that early on users will find a variety of useful resources available through AdaNET.

Over the longer term, these value added services will graduate to the full scope of services that have been defined. Such services include:

- Decomposition and recomposition of total software systems into reusable components and modules,
- Verification, validation, and metrics of software at the system and component levels, and a high-level taxonomic organization of all software resident in AdaNET libraries.

AdaNET will use an open architecture telecommunications network model, with nodes easily added to the base of services available through AdaNET, and with AdaNET itself capable of serving as a node to other existing networks.

Through discussions with NASA, it was identified that AdaNET should broaden its base of support during the first phase. Since the October 12 public announcement of the AdaNET project, and subsequent media releases (See Attachment E), highly enthusiastic and favorable response has elicited from the governmental and commercial sectors. As will be discussed in the section on AdaNET organizational structure, the difficulty currently encountered in bringing in new participants to AdaNET is establishing structures and policies for interaction of all currently participating organizations, developing criteria and policies for interaction of new organizations at both the Board of Governors and Technology

Advisory Board, as well as the formation of a Business/Industry Council. NASA has identified the need for standardized agreements, such as the Memorandum of Agreement signed by the three original government agencies supporting AdaNET (see Attachment B). Provide for a standardized mechanism for the incorporation of additional agency support. A similar document needs to be established to encourage the participation of industry consortia, and with individual commercial and educational entities, for their interaction with AdaNET. Following are some of the organizations the AdaNET team has had discussions with to date to focus this response into the continuing controlled development of the broad based cooperative that comprises AdaNET:

- **The Software Engineering Institute (SEI)** — Director Larry Druffel has identified a member of the SEI staff to serve as a point of contact for AdaNET activities.
- **Martin Marietta Corporation** — An initial meeting was held with a corporate representative of Martin Marietta, who expressed interest in Martin Marietta's support for AdaNET's activities, as well as interest in encouraging the participation of the Software Productivity Consortium (SPC) in Reston, VA.
- **U.S. Department of the Army** — Individuals representing the Army have held discussions with AdaNET and NASA representatives, about the Army's participation with AdaNET. It appears that access and a working relationship with the SIMTEL-20 White Sands Ada Software Repository may be established through these initial contacts.

Other commercial organizations have expressed interest in participation with AdaNET. It is anticipated that following resolution of some of the above mentioned questions, there will be a high-level of commercial interaction with AdaNET.

AdaNET will provide NASA with a specialized outlet for transferring Ada and related technology to the commercial sector. Large volumes of Ada based software have already been developed, and with full scale work beginning on the space station activity, the amount of Ada based software and information that will be produced in the near future will require a facility such as AdaNET to process that information and compile it into reusable formats. The AdaNET activity will not only provide a mechanism for commercial transfer, but also will allow for technology "re-insertion" back into NASA's own development activities. As organizations having their own established Ada technology bases become new participants in AdaNET, the base of developed Ada software and technology that

is available to NASA will expand to include these additional resources. It is this cumulative factor that presents the greatest benefit to individual AdaNET users.

NASA TU will continue to provide financial support for AdaNET at least through its early phases of development, during the initial five years defined as the period for services and facility development, and development and application of cost recovery measures. Costs for services to be provided by affiliate organizations will also be underwritten by NASA. One longer term goal for the AdaNET partnership established with these organizations will be to provide a greater base for cost recovery for their own operations, by identifying additional applications and commercial uses of their services, through markets being serviced by AdaNET.

Computer Software Management and Information Center (COSMIC)

University of Georgia, GA

COSMIC serves as NASA's main software repository for software systems that have been developed by NASA field centers and NASA contractors, as well as other government agencies. The repository provides no value added functions; testing that is done on programs is primarily to ascertain the completeness of submitted systems, as well as their relative reusability. COSMIC maintains approximately 1400 programs in its active inventory. COSMIC has established an extremely successful operational structure, with cost recovery measures that both provide for affordable access to the software systems it provides, and allow COSMIC to recover the majority of its operational costs. It has been found that one out of three programs maintained by COSMIC find re-use within NASA-related organizations. Copies of programs are obtained by ordering from COSMIC. On-line user access to COSMIC programs is not provided. COSMIC has established channels for software acquisition from NASA's Field Centers, as well as with NASA contractors. It also has available resources for and experience with volume media duplication of software systems.

The COSMIC center has expertise in several areas that are of interest to AdaNET, particularly: methodologies used by COSMIC in building its acquisition and distribution channels; use of the DIDS in its software classification; evaluation systems used currently on software offered through COSMIC.

Concern has been expressed by John Gibson, COSMIC Director, that the

functions of AdaNET will duplicate services of or compete with COSMIC, since both facilities are involved with NASA software reuse. It is this similarity that can be used to strengthen the operations of each facility. It is desired that a mutually beneficial partnership will be developed with COSMIC, with each facility providing complementary services to the operations of the other.

Potential teaming activities:

- AdaNET could provide an on-line COSMIC directory and order system for AdaNET users to browse and make on-line orders.
- AdaNET could make available the total software systems it receives to COSMIC, for COSMIC's review for acceptance into its inventory.
- COSMIC could provide to AdaNET its Ada-based software systems as they are received by COSMIC, for AdaNET's application of value added functions to those systems. Systems receiving the value-added functions could be marketed through COSMIC with the additional value added information.

High Technologies Laboratory

University of Houston - Clear Lake, TX

In the short term, AdaNET will be used to enhance information contained in the Software Engineering and Ada Database (SEAD) bibliographic system located at Johnson Flight Center (JFC), in Houston, TX. Methodologies will need to be established so that information relevant to SEAD may be provided regularly as an update to the SEAD from AdaNET. One longer term goal may be for the SEAD, which is currently available only to NASA Field Centers and contractors, to be established as a network node available through AdaNET, in addition to other methodologies the High Technologies Laboratory will implement for expanding its base of potential users. This would make the SEAD system available through the many interactive government and commercial networks that will interconnect with AdaNET.

Of particular interest in the development of AdaNET's value added services is

the development and implementation of a highly refined taxonomic system, which would entail a virtual taxonomy of taxonomies. Current service implementations for the value-added repository functions would be structured in such a way that more refined taxonomic systems could be integrated with little or no restructuring of the databases of information established. Also, it has been recommended that AdaNET examine DOD-STD 2167 as a potential documentation standard for software maintained by AdaNET.

NASA Industrial Applications Center (NIAC)

University of Pittsburgh, PA

NIAC's technology transfer activities include providing computerized information retrieval from NASA's Technology Utilization Network, technical consultation services and/or linkage with other experts in the field of inquiry, to public sector organizations. NIAC serves a six state region, including West Virginia. Dr. Paul McWilliams, Executive Director, is serving as NASA's local point of contact for AdaNET activities. While the level of activity between AdaNET and NIAC is still undefined, early discussions suggest that a strong, mutually synergistic relationship will be developed. AdaNET will provide access to a continually increasing base of Ada technology and applications information, providing an additional resource to NIAC for services it provides to its user base. NIAC will be connect directly to AdaNET, either through AdaNET's linkage with the NASA Technology Transfer Network, or with a direct link. This relationship will be further defined as discussions continue.

NASA Technical Applications Team (TA)

Research Triangle Institute, NC

The NASA Technical Applications Team provides technology matching and problem solving assistance to public sector organizations, to identify and solve critical problems with the application of existing NASA technology. Discussions with TA Director Dr. Doris Rouse, and other members of the TA staff indicate that its relationship with AdaNET will be equivalent to NIAC's. A base of expertise in industrial applications needs to be established as an integral part of AdaNET's overall commercial applications support, that can be called in to

address industry specific technology issues. The participation of the Technology Applications Team with AdaNET provides an immediate source for such expertise. AdaNET will provide the Technology Applications Team with an expanded base of potential users for their services. Additionally, through the AdaNET, DOC OPTI wishes to utilize the technology and expertise of the TA Team to provide support to commercial entities seeking automation and FCM solutions.

1.2.4 Beckley College

Beckley College, in Beckley, WV is located in the heart of southern West Virginia, in a region where many of the traditional infrastructure industries of West Virginia are represented. These industries include coal, oil and gas, timber and glass; industries which are struggling to regain a competitive position in the national and world markets. Beckley College has been developing a curriculum that emphasizes Ada and software engineering in its undergraduate computer science curriculum. It has particular interest in establishing a base of expertise to aid in the development of Ada based applications that will support and improve the productivity of those industries in its region. AdaNET is will work with Beckley College to utilize the multiple resources and support available, in a branch regional center that can focus those resources on industries represented in its region, helping to catalyst industry migration to the use of competitive technologies. Effectively, the "sub-center" model developed could be duplicated throughout the country. With AdaNET's support, Beckley College hopes to develop a base of value added and niched industry specific commercial applications that will help it to establish a basis for cost recovery for operation of its center for applied Ada technology. This cost recovery would result from consulting and development fees which could be generated by industrial support for development of these industry specific applications. This will be one of the pilot models for AdaNET sub-center operations. Software and technology developed at the Beckley College sub-center will become available through AdaNET. Beckley College will commit ongoing support to AdaNET with faculty and student resources, and local administrative support in establishing their local sub-center. Beckley College has and will continue to sponsor local telecommunications access to the MountainNet telecommunications network, in its region, as part of its efforts to stimulate local economic development.

Beckley College desires a seat on the Technology Advisory Board (TAB), be-

cause the TAB's unique interdisciplinary forum will provide valuable expertise in areas to be addressed in the development of this model for regional technology transfer. As this sub-center becomes operational, Beckley College will itself provide a base of expertise in the application of technology transfer models for regional economic development.

1.2.5 Software Valley Corporation

AdaNET will serve as a resource for helping in the development of small advanced technology businesses located in the Software Valley region. AdaNET will provide another base of technology to help establish the long term imaging of the Software Valley region as a center for advanced software technology, by providing a national focus for the collection of Ada and software engineering information and technology. With the Software Valley Initiative's emphasis on Ada as the tool for the application of software engineering technology, AdaNET also provides additional resources to aid in the continued Ada technology training of a large base of software engineers, programmers, and technicians in the region. As part of AdaNET's activities in training and professional development, it will provide its resources and technical expertise in the longer term plan to establish a National Ada Training Center, that would be a subset and initial component of a National Software Campus. Additionally, AdaNET will promote and support the utilization of Ada software technology that has been developed for automation and FCM applications in industrial and manufacturing interests represented in the Software Valley. This supports the long term initiative of developing the region into a center for FCM software technology.

1.2.6 West Virginia University/WVU Research Corporation

WVU will use the resources that become available through AdaNET to establish a stronger base of Ada technology training and software engineering. Starting in Fall 1988, Ada will be the initial computer language taught for all incoming computer science freshmen. This will provide a far greater base of Ada literate programmers and software engineers than has been possible in the past. A student intern program that is being established will allow WVU students to obtain practical work experience, as well as exposure to the wealth of information and technology available through AdaNET. These same resources will provide support to the research and development activities of WVU, in the areas of software engineering, automation sciences, knowledge engineering, and communications technologies. AdaNET information resources, combined with the aforementioned

areas of research, will aid in WVU's research programs for the development of FCM technologies.

As has been stated, one long term goal of WVU/WVURC and the Software Valley Corporation is the establishment of a National Software Campus in Morgantown, with inter-disciplinary areas of study and research and development to include: Ada and Software Engineering, Flexible Computerized Manufacturing, Artificial Intelligence/Knowledge Engineering, and Communications. Support for many of these functions is best provided by non-profit, educational institutions, whose primary missions are education and advanced research. Therefore, WVU has specific interest that those areas of AdaNET expansion supporting the development of such a facility should have a high degree of university interaction and support for its day-to-day operation.

1.3 Summary of AdaNET Services

In summary, the consensus and aggregate views of the organizations described above for the service mission and goals of AdaNET throughout the next three to five years include:

Value-added Ada software and services, and access to similar third party systems:

- Validation and verification
- Taxonomic classifications
- Documentation and tutorials
- Topical search categories
- Life cycle identification
- Electronic and hardcopy duplication of information
- Electronic bulletin boards
- Services and products publications

Network access and expansion:

- Access to Ada Information Clearinghouse
- Access to COSMIC information
- Access to SEAD
- Access to other third party Ada software and information services

Outreach and support programs, and access to similar external programs:

- Access to high level expertise for specific commercial applications development
- Industry transition

- Proprietary software

- Industry forum

Educational information, expertise, and training access:

- On-line courseware

- Seminars and workshops

Support services for application of Ada technology by commercial sector entities.

Chapter 2

Organizational Structure

2.1 Project Activity

This report details the organizational structure being defined for AdaNET. The structure discussed reflects the views and inputs of the sponsoring government agencies and supporting organizations. Topics covered include:

- Use of For-Profit Development Model
- Internal Development Structure
- Organizational Boards
- Interaction with UHCL RICIS and SEAD
- Incorporation of New Project Sponsors
- Interaction with NASA Affiliates
- Incorporation of Private Sector Participants

Another section of this document outlines the current activity on the AdaNET project, including AdaNET project imaging, technical and network planning and team development, and initial assessments of the Ada community's interests and needs. A description of AdaNET related activities at the AdaEXPO '87 is also included. There is coverage of the December 10, 1987 project meeting including a list of attendees, and information concerning:

- the initial AdaNET survey,
- facilitation of AdaNET participant communications,
- network planning and implementation, and
- marketing implications of the initial survey.

An agenda of the this Project Meeting held in Boston during the Ada Expo is also included as Attachment F.

2.2 Organizational Structure

There has been much discussion about what organizational structure would best serve the mission and goals of the AdaNET project and promote effective interaction between its sponsoring agencies. AdaNET must serve both the public and private sectors, as both a catalyst and a clearinghouse for the acquisition and use of advanced software technologies. However, while encouraging re-use of Ada software technology by governmental organizations is obviously one of the project's goals, its primary focus is to encourage the application and use of Ada technology in the private sector. This is combined with the additional task of building a basis for cost recovery into the services provided so that over time the facility will attain operational independence.

These are diverse goals, and may seem contradictory in nature. It is essential that the service develop cost recovery measures to insure its continued, long term survivability; however, it is just as important that services be provided in such a way that small businesses, manufacturers and educational institutions with limited resources experience no economic barriers to acquiring the information available. Such users represent those sectors which should experience the most benefit from the AdaNET service.

In light of such considerations, it is critical that the correct mechanisms be put in place in the early stages of AdaNET's development to allow flexible interaction with public and private sector organizations. An organizational structure must be established that promotes successful internal development of the service.

The following topics are discussed in this report:

- Use of For-Profit Development Model
- Internal Development Structure
- Organizational Boards
- Incorporation of New Project Sponsors
- Interaction with NASA Affiliates
- Incorporation of Private Sector Participants

2.2.1 History of the Concept

MountainNet, Inc. was organized as a for-profit West Virginia corporation in 1983. The foundation of its business plan involves development

of software, information services, and related telecommunications required for their delivery. MountainNet presently offers access to Ada, artificial intelligence and expert systems software, and office automation software tools on its own host computer system. Access is provided through a private network consisting of 17 nodes within West Virginia, and nationally via the Telenet Public Access Network. MountainNet also provides an inter-network gateway with The West Virginia Network for Educational Telecomputing (WVNET), and organization that provides host computer and telecommunications services for all state-supported higher education in West Virginia.

MountainNet first conceived the AdaNET service in 1986 in response to projections of explosive growth of Ada technology and related software engineering tools. Despite a large and growing investment by the government in Ada and software engineering, important element of the infrastructure required to produce gains in real terms in software reuse and software engineering productivity have been lacking.

MountainNet's concept involves building a set of services to be offered primarily to commercial software developers and government agencies to which those developers contract. Such a service would have two major components:

Ada Information Services A value-added information service detailing training opportunities, government initiatives, technology breakthroughs and marketplace information.

Dynamic Software Inventory Software parts which can be reused to build a portion of, or an entire system. The DSI will include related requirements statements, software architecture design and component (detailed) design.

These services would be driven by input from relevant commercial software developers and government agencies. The service would be operated by MountainNet, with revenue from operations complemented by basic research funding from government agencies where appropriate.

In October, 1987, federal funding for initial research and planning was announced. The DoD Ada Joint Program Office and the U. S. Department

of Commerce entered an Interagency Cooperative Agreement with NASA to provide basic support for the AdaNET service. In March, 1988, the Department of the Army also signed the cooperative agreement.

2.2.2 Current Developmental Structure

MountainNet, Inc. is currently serving as subcontractor to NASA, under management of the University of Houston-Clear Lake RICIS to research the feasibility of commercialization of technology transfer of government developed software engineering and Ada technology. The case study for this research is MountainNet, Inc.'s AdaNET service. As described throughout this document, successful implementation of AdaNET services is based upon development of a broad based infrastructure of organizations, each providing unique resources to create a spectrum of available products and technologies to apply to the implementation plan. In order to maintain stability in this dynamic environment, MountainNet, as the developer of AdaNET, maintains operational relationships with these organizations through formal subcontract and service agreements. This holds true for the West Virginia organizations providing original support to MountainNet for AdaNET development, such as West Virginia University and Beckley College. It is planned to build on this base of experiences with the addition of other operational agreements in the next phase.

MountainNet, Inc. has established teaming agreements with a limited number of for-profit organizations to provide support to MountainNet in various phases of AdaNET research and development. These agreements form the basis for organizational relationship, but in themselves are not binding to specific Statements of Work. When executed, these relationships are formalized through standard subcontract arrangements.

Memorandums of Understanding are currently in place to link governmental and educational organizations into the AdaNET infrastructure. At the governmental level, these Memoranda are held by NASA TU with each supporting agency. For educational organizations, such Memoranda are held directly with MountainNet, Inc. by the institution. Memorandums are currently under deliberation with sister TU organizations such as COSMIC (University of Georgia) and NIAC (University of Pittsburgh).

Organizational structures supporting technology transition activities, such as the Federal Advisory Panel, the Technology Advisory Council, and the Business and Industry Council have not as of yet been activated. Full char-

ters for each of these organizations are under developments. Activation of the membership of these boards will be initiated during the latter part of the next phase of the project. These panels are intended to be advisory, rather than governing, in nature, providing technology transition information and recommendations to MountainNet, Inc. in its development and operation of AdaNET.

2.2.3 Internal Audit Controls

It has been recognized that appropriate mechanisms to ensure accountability for federal and other funds be established, particularly to observe the need to avoid the appearance of impropriety resulting from comingling of funds or from unfair competition with private businesses. To this end, MountainNet has implemented accounting structures to ensure complete audit trail traceability of individual activity centers. Therefore, MountainNet's research activity with UHCL has unique activity center, apart and separate from any other activity. While receiving government support for research into the development of this facility, MountainNet will provide AdaNET services on a no-fee basis to its governmental sponsors. Cost recovery structures, from the the research activities, will be tested with private and commercial sector entities, to demonstrate the commercial viability of AdaNET.

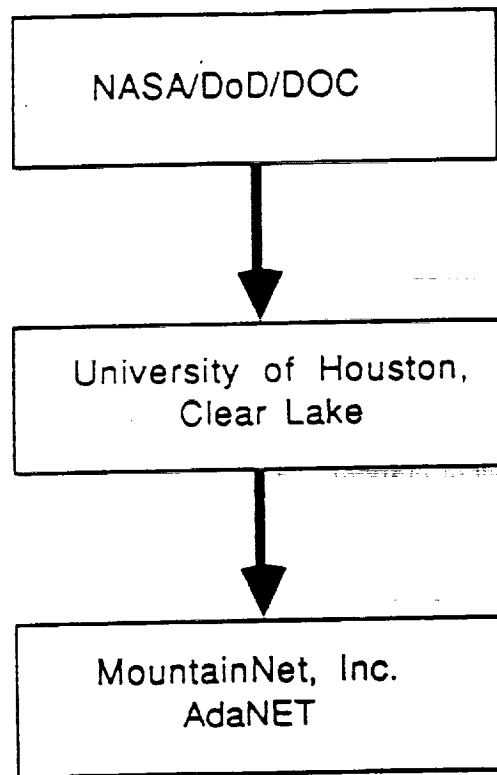


Figure 2.1: Basic Federal Funding and Program Management of the AdaNET Service

2.2.4 For-Profit Development Model

AdaNET has two primary purposes:

1. to develop a transfer mechanism for government developed Ada and software engineering technology to the commercial sector, and
2. to provide such services with cost recovery measures to achieve commercial independence.

Figure 2.1, *Basic Federal Funding and Program Management of the AdaNET Service* is the profile of funding requirements. Figure 2.2, *AdaNET Service Implementation Model* shows how the AdaNET would be created.

It is the consensus of all sponsoring agencies that due to the high level of identification that the AdaNET service must establish to be effective in the commercial sector, there is specific advantage in the service maintaining a for-profit focus. Aggressive marketing approaches will be necessary to maximize the likelihood of success in achieving the stated goals of the service. This approach also allows a more active emphasis in areas necessary to gain commercial recognition and use, such as marketing, advertising, revenue planning, and corporate teaming.

Keeping a for-profit focus will avoid the spectre of unfair competition in the commercial sector by a non-profit entity. This is of particular concern when considering:

- the orientation of AdaNET towards commercial applications in addition to research;
- AdaNET's level of visibility, commercial activities and interaction;
- the number of different private sector entities that will be asked to participate;
- the level of commercial influence possible, and
- the long term goal of independent operational status.

While the service will concentrate on its for-profit mode of operation, some activities developing from AdaNET will emphasize areas that have traditionally been serviced by non-profit, educational entities. One such activity might be the development and operation of a national center for advanced software technology. This would require major support from the educational institutions that are already participants in the AdaNET service and from those institutions which may participate in the future.

Commercial support will be provided through specific contracted work to develop specific services, or through actual use of the AdaNET service. Initial discussions with commercial entities suggest this to be the case. This is in keeping with AdaNET's goal of establishing other bases of support

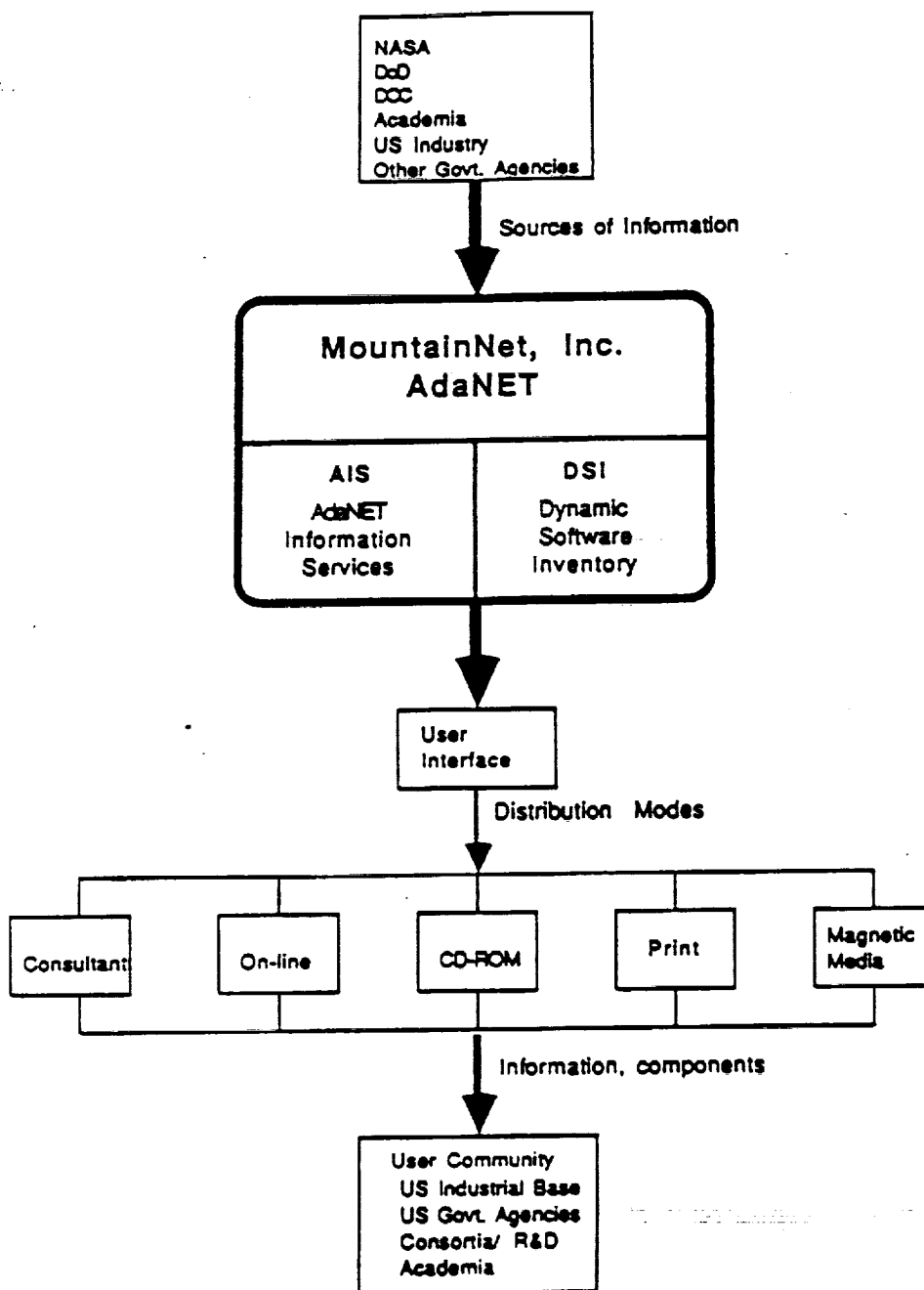


Figure 2.2: AdaNET Service Implementation Model

that are commercially based and longer term than governmental funding. It also serves to heighten responsiveness to the commercial marketplace; the service will not attain commercial viability without that responsiveness.

2.2.5 Internal Development Structure

The most critical element for successful implementation of the AdaNET service is the development of teams for internal management, technical development, and marketing. These teams will be responsible for both internal development, as well as the coordination and delivery of contracted services. One of the major outcomes of current planning and research will be the development of the technical implementation team. MountainNet's internal technical staff will coordinate the activities of the extended development and support team described below. This staff will consist of key "anchor" individuals possessing specific areas of technical expertise, who will coordinate application of internal and external resources to their specific implementation areas.

Private sector participants represent another resource to which AdaNET users can be directed. AdaNET will utilize the resources of many commercial and educational organizations, thereby enlarging the available pool of expertise. MountainNet is entering into corporate teaming agreements with many commercial organizations with areas of expertise that will also be valuable to development of the AdaNET service. Such agreements are of strategic importance in the development and long term support of the service; this concept will continue to be used as the service matures. As part of these agreements, private sector participants will be able to maintain their proprietary interests.

In keeping with the role of AdaNET as both a catalyst and clearinghouse, it is not the intent of MountainNet to develop all required capabilities and expertise internally, or to offer only internally developed services. AdaNET's goal is to provide an open architecture into which organizations providing valuable information, services or expertise can offer their resources as part of the total pool of services available. Likewise, the public information and technology available through AdaNET will not be held to any closed group. The success of the service is based on the interaction with as many participants as possible. Its use and growth are synergetic: information and technology are put into the service, and users take out what they need, in turn developing their own bases of expertise. Through continued participation, these same users can become additional resources available to other

AdaNET users.

2.2.6 Organizational Panels

Much time has been spent trying to define organizational relationships that facilitate effective interaction between MountainNet's AdaNET service, its governmental sponsors, and the private sector organizations either providing support to or using the services. Three panels will be formed. Earlier discussions referred to these panels as:

- Board of Governors
- Business and Industry Council
- Technology Advisory Board

After subsequent deliberation and inquiry into the various federal laws regulating governmental and private sector interaction, the following names will be adopted:

- Federal Advisory Panel
- Business and Industry Council
- Technology Advisory Council

Following sections will discuss the purpose of each of these panels. The Office of Productivity, Technology and Innovation attorneys have researched the potential legal implications of these organizational structures with respect to public and private sector representatives holding seats on the same panel. They have determined that the organizational structures defined in this document are well within allowable federal guidelines.

The major difference in focus between the organizations defined early in the project and those defined in this document is the separation of governmental and private sector interaction with the AdaNET service. The organizational panels have maintained the same focus; however, the governmental and private sector representatives have been separated on two of the panels. The Federal Advisory Panel is now composed entirely of governmental representatives, and the Business and Industry Council consists solely of private sector representatives. The Technology Advisory Council still has representation from both sectors.

The intent in creating the original Board of Governors was to facilitate participation by any organizations committing resources or "sponsoring" AdaNET development. All organizations meeting this criteria are governmental organizations, and this will continue to be the case. (As mentioned previously, commercial support will be provided both by end users, and through specific contracts and teaming agreements.)

The Business and Industry Council will serve as the main point of interaction with identified economic communities, industries, professional organizations, or individual companies that desire a higher level of input and involvement with the AdaNET service than that of being only an end user of services. It also provides an initial point for interaction with those organizations that represent additional resources for development and service offerings, and potential new user communities.

The Technology Advisory Council will provide the focus for those organizations working more closely with development, providing technical focus in all areas necessary. These include not just areas of competence within the field of hardware and software engineering and communications, but also include expertise in marketing, advertising, corporate teaming and partnering, finance, business plan analysis and strategic planning. The Technology Advisory Panel consists of representatives from both public and private sector organizations.

MountainNet will serve as the focal point for communications and coordination between governmental and commercial sector interests and will be the mechanism to solicit the involvement of private sector interests. The following are more detailed descriptions of the organizational groups described above:

Federal Advisory Panel

A way to coordinate between the three sponsoring government agencies has been needed. Major cooperation and communication between these partners needs to occur to insure mutually successful returns on participation. Quarterly project review sessions are not adequate for the higher level interaction required. Some structure is necessary to facilitate the process. Participation on the Federal Advisory Panel will provide this mechanism. Representatives from the three government agencies supporting the AdaNET service will work with MountainNet to determine the initial membership of this panel.

The Federal Advisory Panel will consist of those government organizations

with the highest levels of resources committed to the project. The individuals on this board will hold positions within their organizations from which they can direct the resources that are to be applied to the AdaNET service. As was true of the previous structure, the Executive Council of this Federal Advisory Panel will likely be that subset of the participants that represent those government organizations who are the original stakeholder participants, and those organizations with the the highest level of committed resources.

The Federal Advisory Panel will:

- provide a common forum for the resolution of questions relating to interagency interactions,
- provide input into the direction of project focus and deliverables, and
- establish a common point for regular interaction and working sessions with MountainNet's staff and agency representatives.

Within the current government organizations supporting the AdaNET service, there is an ongoing need to explicitly define the deliverables and schedules that satisfy the goals of individual participants. Each organization has specific returns that are sought for supporting the service and specific milestones and deliverables are desired to build those returns. The Federal Advisory Panel will be used as the vehicle for such discussions. The agencies now participating in this interagency cooperative will use this forum to determine mutually acceptable project deliverables, with high level interaction with MountainNet's project management staff. Frequent meetings of the panel will be held, in addition to regular electronic communications through electronic mail, to maintain a high level of contact and interaction among sponsors and the members of MountainNet's management team.

These same agencies need to address general panel operating guidelines, especially pertaining to the admission of new project sponsors to the Federal Advisory Panel. Issues for consideration include:

- Definition of criterion for new board membership
- Criterion for continuance or termination of membership
- Process of incorporation of new members' goals with those of existing members

Discussion has indicated that it is the consensus of the agency participants that criteria for membership on this board should be established. One generally accepted criterion is that all organizations represented must have made a substantial commitment to the AdaNET service of the types of resources described in the statement of mission and goals. This topic is further addressed in a later section entitled Incorporation of New Project

Sponsors.

The panel's official contact with private sector project participants will be through MountainNet; this does not include those entities which are contractually affiliated with any of the sponsoring agencies. Recommendations and conclusions reached by members which are part of the interagency cooperative with NASA will pass those recommendations to NASA (as contracting agency) for consideration, and subsequent direction will be passed to MountainNet if desired and appropriate.

Mission and Goal Statement

The mission of the AdaNET Federal Advisory Panel is to provide assistance and guidance to MountainNet staff throughout the development and operation of AdaNET services. The Federal Advisory Panel links the AdaNET service with the government organizations and communities it serves, reflecting the ideas, focuses, and needs of each sponsor. The panel is composed of key individuals from the governmental sector who have been instrumental in encouraging and committing their respective organization's support of the AdaNET service. Each of the Federal Advisory Panel members shall hold such positions within their respective organizations to be able to govern, direct or allocate resources, including human, fiscal, informational and/or technical, as appropriate, to further the mission and goals of the service.

The panel will give assistance and guidance in the following functional project categories:

- Guidance in Organizational and Operational Policies
- Determination of Milestones and Deliverables
- Identification of Sponsors' Individual Goals
- Identification of Sponsors' Participation and Commitments
- Coordination of Governmental Sponsors' Efforts
- Incorporation of New Governmental Sponsors

These recommendations will keep the AdaNET service responsive to its service base and will be incorporated by the MountainNet staff as it manages and directs the course taken by the service.

The board plans to meet quarterly to be apprised of the current status of operations, as well as to provide assistance and guidance in the above referenced functional project categories. The use of electronic communications will provide on-going communications between all members of the panel and MountainNet. More active interaction may be established by

each member through the identification of representatives from within their respective organizations to provide concentrated technical support to the AdaNET service. The initial number of members of the Federal Advisory Panel shall be set at eleven (11) charter members. These charter members, with the MountainNet staff, shall serve as the nominating committee for additional members. At no time shall the Federal Advisory Panel exceed twenty-one (21) members. Organizations will maintain representation on the Federal Advisory Panel for a period of up to nine months following the organization's termination of support.

A standing Executive Committee of no more than seven but at all times at least five members shall be initially constituted from the Charter organizations providing human, monetary and/or technology resources in support of the AdaNET service. The Executive Committee will make policy recommendations for ratification by a majority of the Federal Advisory Panel.

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AdaNET Project Staff

The Business and Industry Council

The Business and Industry Council shall serve as the mechanism for bringing commercial and other private sector entities into participation with the AdaNET service. Organizations looking for additional ways to utilize the technology available through the AdaNET service should initially interact at this level; such organizations may include major industry and manufacturing concerns, large and small businesses representing additional resources of Ada technology expertise, and professional organizations. This provides an initial mechanism for their interaction, as well as allows those organizations not wanting higher level involvement to maintain a tie with the activities and developments. Representatives on the Business and Industry Council should somewhat parallel the authority represented on the the Federal Advisory Board. These individuals may elect to nominate representatives to the Technology Advisory Panel, to provide more technically oriented interaction with the AdaNET service.

This panel provides a direct link to those communities to which MountainNet will target its outreach and support activities. It will also provide

a link between those industrial entities who currently have strong established bases of technology and those organizations trying to develop such expertise. Activity on the Business and Industry Council represents a more "arms-length" relationship with MountainNet than that of the governmental sponsors or the organizations with subcontract or corporate teaming agreements in place. Many organizations initially interacting only at these board levels may recognize that a higher level of interaction is warranted by their capabilities and expertise, as well as the recognition of how participation supports their individual self-interests. Such organizations may migrate into roles on the development and support team.

Mission and Goal Statement

The mission of the Business and Industry Council is to provide assistance and guidance to MountainNet staff throughout the development and operation of the AdaNET services. The Business and Industry Council links the services with the organizations and communities it serves, reflecting the ideas, focuses, and needs of each participating and targeted segment of these organizations and communities. The council is composed of individuals from key commercial sector organizations who have demonstrated leadership in innovation, research, development and the application of technology for America's productivity enhancement. Each of the Business and Industry Council members shall hold such positions within their respective organizations to be able to influence the participation with or support for the AdaNET service by their respective industries, companies, or professional organizations.

The council will give assistance and guidance to MountainNet in the following functional project categories:

- Target sector identification and needs
- Service recommendations
- Organizational participation and resources
- Productivity enhancement applications

These recommendations will serve to keep the AdaNET service responsive to its service base and be incorporated, as appropriate, by MountainNet staff as it manages and directs the course taken by the service.

The board shall meet semi-annually, to be apprised of the current status of operations, as well as to provide assistance and guidance in the above referenced broad based functional project categories. More active interaction

may be established by each member through the nomination of representatives from within their organization to serve on the Technology Advisory Council. No limitation has been set on the number or organizations with representation on the Business and Industry Council.

A standing Executive Committee of no more than seven but at all times at least five members shall be initially constituted. The Executive Committee will convey recommendations made by the Business and Industry Council.

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AdaNET Project Staff

Technology Advisory Council

The Technology Advisory Council provides the technical applications interface between MountainNet and organizations represented on the Business and Industry Council, as well as organizations working more closely with MountainNet in subcontract/teaming arrangements as part of the development and support team.

While interaction and support of member organizations with MountainNet and the AdaNET service can occur without a formal structure, this council will help to organize and coordinate the efforts of this highly diverse and potentially very large group more effectively. Additionally, since each member will only interact with MountainNet staff and small groups of other Technology Advisory Council members, meetings will allow interaction of the whole council that would otherwise not occur. Such interaction is valuable to both the AdaNET service and the members themselves in allowing for a wider ranging flow of communications, ideas, and creativity. Mr. Donn Philpot is serving as the Technology Advisory Council Coordinator to organize initial membership council.

Mission and Goal Statement

The mission of the Technology Advisory Council is to provide technical assistance in specific areas of expertise to MountainNet staff throughout the development and operation of the AdaNET service. The Technology Advisory Council provides an interactive technical resource from each organization. The areas of technical expertise represented on the Technology Advisory Council will be maintained to reflect the diverse ideas, focuses, and needs of each participating and impacted segment of the organizations

and communities served by the AdaNET service. The council is composed of individuals from each of the commercial and educational sector organizations supporting the AdaNET service, who possess areas of expertise needed to round out the base of available talent and knowledge required for successful development and maintenance of the AdaNET service. Each Technology Advisory Council member shall provide regular and on-going technical support and input to the MountainNet staff, as appropriate. The council will give technical assistance and guidance in the following functional project categories:

- Research, development and maintenance of repository functions
- Services development
- Market research
- Revenue planning
- Fiscal planning and analysis
- Operations research
- Productivity enhancement measurements

This technical input will provide a base of technical emphasis that would be unavailable within any one organization.

Due to its diversity and potentially large number of participants, the board shall meet semi-annually, to be apprised of the current status of operations, as well as to report on each functional area of activity. The Technology Advisory Council shall be functionally segmented. Members of the Technology Advisory Council also may also serve as the active representatives of organizations with membership on the Business and Industry Council. No specific limitation has been set for a maximum number of members of the Technology Advisory Council.

Revised June 1988
AdaNET Project Staff

2.2.7 Long Term Interaction with University of Houston - Clear Lake

MountainNet has held discussions with representatives of UHCL RICIS to explore potential long term interaction of UHCL RICIS with MountainNet's AdaNET facility, once AdaNET is commercially self-supporting. The following are under consideration, for further discussion with UHCL RICIS representatives:

- Support in coordination of the Technology Advisory Panel: MountainNet proposes that Dr. Charles McKay serve as Chief Advisor to this organization, and that University of Houston - Clear Lake host its meetings.
- Access to resources and information maintained by MountainNet in support of the AdaNET project to support RICIS research activities; this may include hardware, software, research library and staff resources. Such resources may be provided through telecommunications access, or on-site research at MountainNet facilities, under sponsored research programs. Continuing discussions will define the scope and structure of such arrangements.
- Incorporation of RICIS programs as part of the service offerings available through AdaNET. In addition to interaction with SEAD (detailed in the following section), services provided by the Space Business Information Center and the Software Engineering Professional Education Center could be offered through AdaNET.

2.2.8 Interaction With SEAD

As part of the Phase II Statement of Work, MountainNet was tasked with planning for how the AdaNET service could support the RICIS Software Engineering and Ada Database (SEAD). Specifically, it is desired to increase SEAD's commercial focus. Throughout the course of Phases I and II MountainNet has investigated various possibilities for how such support could be provided to the SEAD.

Discussions with Morris Liaw, Principal Investigator of the SEAD project and others at UHCL have identified the following levels of potential interaction between MountainNet's AdaNET Information Services (AIS) and UHCL's SEAD:

1. No integration;
2. Communications integration: MountainNet provides a telecommunications link into the SEAD for access to the SEAD by AdaNET users;
3. Data integration: AIS and SEAD exchange data on a regular basis; or,
4. Full integration: Merging AIS and SEAD under same name, structure and user interface.

The first option would indicate that no valuable interaction can occur between the two organizations, and that the AdaNET service can do little to help expand SEAD or to provide commercialization support; this is believed to be false, and hence is not considered as a viable option.

MountainNet believes a combination of both 2) and 3) to be the most effective level of interaction, for the following reasons:

- The combination of choices allows MountainNet to achieve its goal of providing support in augmenting information available through SEAD (through regular updates to the SEAD of information collected in the AIS); and
- Through establishment of telecommunications connections, provide additional commercialization support to SEAD, by expanding its base of potential users to include all users of the AdaNET service;
- There would be very little restructuring of the service functions and goals of either SEAD or AIS;

Complete integration as defined in 4) is not believed to be desirable for the following reasons:

- AIS and SEAD services are currently targeted to two separate user communities. SEAD currently services internal NASA organizations and NASA contractors/subcontractors who access SEAD via NASA internal telecommunications networks. AdaNET's primary focus is on private sector users. Clarification has not yet been given on whether SEAD can expand its services for general private sector use, and still maintain its direct linkages to its NASA users (due to network security concerns);
- Elimination of the AIS as a major service within AdaNET will radically reduce the value of information presented through AdaNET, and hence, its commercial viability; the alternative, merging of SEAD into AdaNET, is not considered a reasonable alternative to the developers of SEAD;

- Presentational formats and retrieval mechanisms for information to be contained in the AIS differ from those of SEAD; MountainNet has evaluated various presentational formats and retrieval mechanisms for on-line information. The method chosen (text retrieval/ hypertext systems) is deemed to be the most desirable for the AdaNET environment. It is suggested that a quantitative study be conducted to assess relative user responsiveness/usage levels on both systems, to evaluate (where information may be duplicated) user-preferred methods of delivery.

Before further planning of AdaNET/SEAD interaction can occur, additional planning by the SEAD staff must be completed. As stated above, one major decision will be whether SEAD will be allowed to incorporate non-NASA private sector users while maintaining its linkage into NASA networks. Additionally, clarification as to the SEAD's ultimate host machine will aid greatly in determining the level of data exchange possible and specific requirements for establishing telecommunications linkages. Further elaboration of RICIS goals for SEAD commercialization are necessary, in order to completely address how MountainNet, through its AdaNET service can help add other commercialization support services.

2.2.9 Incorporation of New Project Sponsors

New government sponsors may become active in supporting development of the AdaNET service. Such support could be provided through either interagency agreement and support through the existing cooperative, or through additional contracting mechanisms. In the prior case, a standard Memorandum of Understanding with NASA, (as the contracting agency), based on the one signed by the three original sponsors, will be established. It is agreed upon by all existing sponsors that as other governmental organizations apply their resources to development of the AdaNET service, those organizations should be given representation on the Federal Advisory Panel. This has positive results for both the newcomers and the existing sponsors, since all participants will have a common forum for sharing information about their respective goals in the project, and the resolution of potential conflicts in those goals. The new sponsors' agendas will need to be incorporated into the common agenda of the existing sponsors, and project milestones and deliverables will need to be adjusted and expanded accordingly.

2.2.10 Interaction with NASA Affiliates

A strong working relationship is evolving with NASA affiliate organizations identified to support the AdaNET service. The support, participation and resources contributed by these organizations is currently being underwritten by NASA as part of its in-kind contribution to the service. This participation is intended to provide early returns to all participants:

For example:

- A base of resources and expertise will be made available to apply to various facets of development of the AdaNET service; such support will help in "lessons learned" and in applying existing technology solutions to planning development, and implementation.
- These organizations represent additional sources of expertise and technology that will be made available to users of the AdaNET service.
- Through markets identified, additional opportunities for commercial/private sector support will be afforded to participating affiliates.
- MountainNet will perform catalyst and networking functions, placing entities needing specific technology solutions in touch with those organizations possessing such expertise.

See Attachment A for a listing of those NASA affiliates currently providing support.

2.2.11 Incorporation of Private Sector Participants

MountainNet's interaction with the private sector will be as both provider and user of services and expertise. The delineation between those organizations that are providers of resources and those that are users should be almost impossible. The same groups using services and utilizing the information, software and expertise available, should also represent, in time, an additional resource that can be added to the team of organizations supporting the AdaNET services.

The AdaNET project staff will serve as the focal point for communications and coordination between governmental and commercial sector interests. This is appropriate to the service's main focus on commercial sector organizations; this will provide the mechanism to recruit the involvement of

commercial sector interests both as additional resources and as users of services. The AdaNET project staff will identify the needs of those private sector communities with which it interacts, and then work through the Federal Advisory Panel to bring those needs to the attention of the federal agency sponsors. Private companies listed as users of software and services should eventually come full circle in the process, until they are also providers of software and technology to the AdaNET user base.

2.3 Outline of Project Activity

Initial presentation of the AdaNET service was made to attendees of the Ada Expo '87 and ACM SIGAda conferences. This presentation was the culmination of planning and development in organizational planning, project imaging, and strategic and technical planning. The week's activities were centered around:

- AdaNET Project Meetings
- Ada Users Survey
- Network Planning and Implementation
- Initial Market and Services Analysis

2.3.1 AdaNET Project Meetings

Project meetings were held on the evening of December 10, 1987, following completion of the Ada Expo '87. The first meeting held included only representatives of the sponsoring agencies. Specific points for discussion focused on the need for higher level coordination between governmental participants, MountainNet, and the University of Houston - Clear Lake. Discussion was also held on the participation of the Department of the Army DISC4 in the AdaNET project.

A second meeting was held, with the following in attendance:

Virginia Castor - DOD AJPO	Roy Bivens - NASA TU
Edward Liebhardt - DoA DISC4	Henry Clarks - NASA TU
Charles McKay - RICIS	Paul McWilliams - NIAC
Mike Digman - MountainNet	James Rautner - MountainNet
Kevin Dyer - MountainNet	Frances Van Scoy - WVU
John Heizer - DOD OPTI	Robert Wallace - TA

Topics for discussion included:

- Final changes to Organizational Views report

- General update on AdaNET's Ada Expo '87 activities;
- Discussion of project deliverables;
- Organizational planning.

The views expressed in all areas of discussion are reflected in either the discussion of Organizational Views or in the discussion of current organizational structure described in this chapter. The agenda of this meeting is included as Attachment E.

2.3.2 Initial AdaNET Survey

An initial survey was conducted at Ada Expo '87; copies of the survey instrument were distributed at the Ada Expo '87 with brochures about the AdaNET project. This survey was intended to gather the following types of information:

- general demographic information,
- Ada applications areas represented at the conferences,
- levels of interest in potential service offerings, and
- current hardware and telecommunications utilization.

The survey, while only a preliminary sampling of those in attendance, yielded interesting information about the current interests, among those participating in the Ada marketplace. The survey was designed with a limited number of very focused questions, to increase the likelihood of response, as well as to get initial information about those areas needing more extensive follow-up. The demographic information provided is enabling the AdaNET project staff to follow up with mailings and further survey activities. Some findings from the survey are noted in the sections which follow.

2.3.3 AdaNET Participant Communications

Two factors have created a need for a means of communication and exchange of textual information regarding the AdaNET project. There are:

- the wide geographic distribution of participants in AdaNET project oversight and technical development, and
- the difficulty in coordinating schedules for meetings and expense of travel to meetings.

Many of the individuals involved already participate in one or more computer networks or services. These services include:

- Defense Data Network (DDN)

a link between those industrial entities who currently have strong established bases of technology and those organizations trying to develop such expertise. Activity on the Business and Industry Council represents a more "arms-length" relationship with MountainNet than that of the governmental sponsors or the organizations with subcontract or corporate teaming agreements in place. Many organizations initially interacting only at these board levels may recognize that a higher level of interaction is warranted by their capabilities and expertise, as well as the recognition of how participation supports their individual self-interests. Such organizations may migrate into roles on the development and support team.

Mission and Goal Statement

The mission of the Business and Industry Council is to provide assistance and guidance to MountainNet staff throughout the development and operation of the AdaNET services. The Business and Industry Council links the services with the organizations and communities it serves, reflecting the ideas, focuses, and needs of each participating and targeted segment of these organizations and communities. The council is composed of individuals from key commercial sector organizations who have demonstrated leadership in innovation, research, development and the application of technology for America's productivity enhancement. Each of the Business and Industry Council members shall hold such positions within their respective organizations to be able to influence the participation with or support for the AdaNET service by their respective industries, companies, or professional organizations.

The council will give assistance and guidance to MountainNet in the following functional project categories:

- Target sector identification and needs
- Service recommendations
- Organizational participation and resources
- Productivity enhancement applications

These recommendations will serve to keep the AdaNET service responsive to its service base and be incorporated, as appropriate, by MountainNet staff as it manages and directs the course taken by the service.

The board shall meet semi-annually, to be apprised of the current status of operations, as well as to provide assistance and guidance in the above referenced broad based functional project categories. More active interaction

- NASA's electronic mail system
- ARPANET
- BITNET
- Dialcom
- Telenet electronic mail
- CompuServe
- MCI mail
- Source
- Other commercial networks and private host computer systems

At this stage of the project, there is no practical method for creating inter-network gateways among all the different networks that would be required for every project participant to be able to use that participant's own host system for electronic mail and document transfer activities. In view of this, the project team has implemented an electronic mail and document service for AdaNET project participants hosted on a DEC Vax computer system. The service is menu-oriented, very easy to use, and can be accessed at no charge through Telenet.

Terminal emulations that are presently supported include DEC VT series, Data General, Lear Siegler, Televideo, ADDS, and other video terminals and emulators. (Responses to an item on the Ada Expo '87 questionnaire suggest that DEC, IBM PC, and Apple computers and video terminals are by far the most common hardware used by the respondents.) Copies of the Kermit communication and file transfer protocol which typically provides DEC VT series emulation are available from MountainNet for virtually any model of microcomputer.

An AdaNET Document Transfer and Electronic Mail Service User Requirements Documentation form has been prepared and distributed to the various agencies and organizations participating in the project at this point. Attachment D of this document is the standardized form developed for establishment of usernames for project participants. Completion of this form by each project participant is required prior to account activation.

2.3.4 Network Planning

In order to ascertain the extent to which some of the various electronic mail and document transfer systems are used by potential AdaNET users, a question regarding network use was asked on the informal questionnaire

distributed at the Ada Expo '87 in Boston. The following table summarizes responses to that question:

**Electronic Mail and Networks Used
by Ada Expo Attendees**

Network Name	Frequency	Percent
DDN	20	23.3
ARPANET	32	37.2
NASA MAIL	02	02.3
BITNET	09	10.5
TELENET	15	17.4
MCI	00	0
COMPUSERVE	12	14.0
DIALCOM	02	02.3
SOURCE	04	04.7
USENET	03	03.5
TYMNET	01	01.2
CSNET	03	03.5
OTHERS	09	10.5

Notes: Number of respondents = 86; respondents were asked to mark all those networks that apply.

Though use of various network services for electronic mail and document transfer is common among this group, even ARPANET, the most commonly used network, was used by less than 40 percent of the respondents. As already noted, responses to a second item on the Ada Expo '87 questionnaire suggest that DEC, IBM PC, and Apple computers and video terminals are by far the most common hardware used by the respondents.

2.3.5 Current Network Implementation

Two host computer systems are initially being used to support planning and development activities: a Digital Equipment Corporation Vax 11/780 located in Buckhannon, WV; and a Data General MV8000 located in Dell-slow, WV.

These host computer systems are connected to MountainNet's own telecommunications network. That network is linked to Telenet and the West Virginia Network for Educational Telecomputing, which is in turn connected

to ARPANET, BITNET, and Suranet. Through these network gateways, host computer systems are available via local direct or dialup access from most of the continental United States.

2.3.6 User Survey and Marketing Implications

Approximately 550 project brochures with market survey forms included were distributed, individually, at the conference. Eighty-six (86) completed market survey forms were completed at the conference, a response rate of 16 percent. Since the conference additional surveys have been returned, some with cover letters expressing further interest in becoming involved with the support and use of AdaNET. Some have also responded with telephone inquiries about the project.

AdaNET Brochure

Included with the market survey, the brochure incorporated three "step-pages" of information describing the AdaNET project, the government agencies and private businesses involved in its inception, and the value-added services and products it will provide. These are included as Attachment F. A summary of the intent of these pages follows:

AdaNET

*The Advanced Development Network
For Ada Software Applications*

This page explains the AdaNET service as an effort involving government, education and the private sector, and its reason for being; that is, to gather, refine and disseminate information regarding the Ada computer language and software engineering in order to encourage use of Ada for better software engineering and improved productivity.

AdaNET

The Ada Soft-Where-House

This page outlines how the AdaNET services and products will be stored,

classified and made available to the commercial market place, and academic and government organizations, and describes a few of these organizations that should benefit immediately and directly. The Ada Soft-Where-House represents the focus for access to the reusable components, objects and information services.

AdaNET

Value-added Services and Products

This page is a detailed Listing of the services and products that are to be offered.

General Impressions

The AdaNET project staff had discussions with many attendees of the Ada Expo'87 Conference, both on the floor of the display area and in small informal discussion groups. The impressions gleaned from these discussions and from the communications which have taken place since the conference have resulted in the general impression that the primary questions regarding the AdaNET service are:

1. How soon will it be available?
2. How can one access AdaNET?
3. How much will access cost?

A fourth impression is that many attendees felt that the AdaNET project represents a needed and timely step.

Initial Market Survey

A preliminary analysis of the initial market survey revealed some interesting characteristics, which are under further analysis for distribution to the project participants in the near future. The complete form is included as Attachment C. Here is a summary of the three questions posed to survey respondents:

1. With which Ada-related professional organizations are you affiliated?

2. Is your organization involved in Ada software development?
If yes, please check all that apply (various categories were listed).
3. Which AdaNET services or information would you find useful? (various services were listed; users responded that each service was "Not Useful", "Useful", or "Very Useful")

The results to question one were as follows:

	YES		NO	
	N	Percent	N	Percent
SIGAda	61	70.9	25	29.1
AdaJUG	12	14.0	74	86.0
IEEE	34	39.5	52	60.0

As was expected, considering the audience that was being addressed, a significant number of respondents, 70.9%, indicated a membership in SIGAda. The balance of the respondents show 14.0% membership in AdaJUG, and 39.5% membership in IEEE. The total adds to more than 100% due to multiple membership affiliations by some respondents.

From these respondents, most of whom are members of professional Ada organizations and who represent a sophisticated population, significant indicators are beginning to emerge. From the responses of this group to the third question, the most useful services are those listed below. These areas were the areas that elicited a "very useful" response from over 66% of the respondents.

- Ada Faceted Classifications for Reuse
- Ada-Specific Metrics
- Software Engineering Methodology
- Topical Search Categories for Reuse

Services or information which were viewed as "useful" by audience include:

- Commercial products and services
- Contracting opportunities

- Documentation and information
- Project management software
- User Communications

Services or information viewed as "not useful" to this audience are as follows:

- On-line tutorials
- Computer based training
- Telephone Help Line

Respondents who indicated that Ada-faceted Classifications for Reuse, Topical Search Categories for Reuse, and Software Engineering Methodology were "very-useful" tended to fall into the following software development categories:

- Data Bases
- Education
- Engineering
- MIS Functions
- Process Control
- Scientific
- Telecommunications
- Tools
- Weapons

Ada-specific Metrics were found to be "very useful" for the following software development categories:

- Scientific
- Data Bases
- Engineering
- Telecommunications
- Weapons

Initial service offerings will be concentrated upon those categories which this preliminary survey indicates would have the highest tendency to be probable value-added migration paths for technology transfer offerings.

Attachment A

Project Participants

National Aeronautics and Space Administration (NASA)
Technology Utilization Division

- *NASA Industrial Applications Center (NIAC)*
University of Pittsburgh, PA
- *NASA Technology Application Team*
Research Triangle Institute, NC
- *Computer Software Management and Information Center (COSMIC)*
University of Georgia, GA

University of Houston-Clear Lake (RICIS)
Research Institute for Computer and Information Systems

- *Space Business Information Center*
- *High Technologies Laboratory*

Department of Commerce (DOC)

- *Office of Productivity, Technology and Innovation (OPTI)*

Department of Defense (DOD)

- *Ada Joint Program Office*

Department of the Army (ODISC4)

- *Office of the Secretary of the Army, Directorate of Information Systems for Command, Control, Communications and Computers*

West Virginia University/WVU Research Corporation
Morgantown, WV

Beckley College
Beckley, WV

Attachment B

Project Deliverables

Report on participant organizational views	November 30, 1987
Draft organizational plan	December 21, 1987
Final organizational plan	January 25, 1988
Draft business plan	February 22, 1988
Draft organizational documents and agreements	February 22, 1988
Draft technical plan	March 7, 1988
Draft schedule of user fees and charges and associated analysis	March 14, 1988
Final organizational documents and agreements	April 25, 1988
Final technical plan	April 25, 1988
Final schedule of user fees and charges and associated analysis	April 25, 1988
Final Business Plan	May 30, 1988
Final Report on Phases I and II	May 30, 1988



AdaNET
Ada Market survey

The accompanying packet of materials describes AdaNET-The Advanced Development Network for Ada Software Applications. The few minutes you spend answering the questions below will provide information to be used in the planning and implementation of AdaNET services. If you wish to receive more information about AdaNET, please attach your business card or provide your name, address, and telephone number at the bottom of this survey form. Unless you indicate otherwise, all information you provide will remain confidential and will be reported in summary form.

By taking the time to answer the questions below, you identify yourself as candidate for participation in onsite user tests of AdaNET services.

1. With which Ada-related professional organizations are you affiliated?
☐ SIGAda ☐ AdaJUG ☐ IEEE Other _____

2. Is your organization involved in Ada software development?
☐ No ☐ Yes, please check all types that apply:
☐ Consumer ☐ Scientific ☐ Engineering
☐ Business/ ☐ Data Bases ☐ Telecommunications
☐ MIS Functions
☐ Education ☐ Financial Applications ☐ Weapons/C3I
☐ Process Control ☐ Chemicals/Petroleum ☐ Compilers
☐ Tools

3. Which AdaNET services or information would you find useful?
(Circle One)
Not Useful Useful Very useful

Commercial Product and Services	0	1	2
Contracting Opportunities	0	1	2
Ada Faceted Classifications for Reuse	0	1	2
Topical Search Categories for Reuse	0	1	2
Documentation and Information	0	1	2
User Communications	0	1	2
Ada-Specific Metrics	0	1	2
On-Line Tutorials	0	1	2
Computer-Based Training	0	1	2
Telephone Help Line	0	1	2
Project Management Software	0	1	2
Software Engineering Methodology	0	1	2

4(a). To which data/telecommunications networks do you have access?
___ DDN ___ ARPANET ___ Nasa Mail ___ BITNET/Mailnet ___ Telenet Mail
___ MCI Mail ___ Compuserve ___ Dialcom ___ Source ___ Other ___

(b) What computer hardware do you use to access the resources you checked in 4(a)?

___ Microcomputer-please identify the manufacturer and model: _____

___ Video terminal-please identify the manufacturer and model: _____

Please attach your business card here or provide your name, address, and telephone number:

Your Name: _____

Organization: _____

Position or Title: _____

Mailing Address: _____

City, State, Zip _____

Thank you for taking the time to provide the information requested.

AdaNET Management Team
December 1987

AdaNET
Electronic Mail Service and Document Transfer
User Registration Form

Please type your information at the "--->"

1. Name, address, telephone:

Person's Name: --->

Organization: --->

Address (#1): --->

Address (#2): --->

City and State: --->

Zipcode: --->

Primary Telephone Number: --->

Alternate: --->

FAX Number: --->

(Continued on next page)

2. Network ID's (e.g.: BITNET: VM5521 @ WVNVM, DIALCOM, COMPUSERVE, etc)

Preferred AdaNET userid: ---->

DDN userid: ---->

NASA Mail userid: ---->

BITNET userid/node: ---->

DIALCOM userid: ---->

COMPUSERVE userid: ---->

SOURCE userid info: ---->

MPL userid: ---->

other (specify): ---->

3. From what location will you normally be accessing AdaNET?

4. What device will you be using to access AdaNET (e.g., IBM-PC, Tele-video 924 video terminal, etc) ? Please be specific as to the manufacturer and model number.

5. What type of telephone modem do you have connected to the device listed in #4 above? Please be specific as to the manufacturer and model number.

Thank you. Please return this questionnaire to:

AdaNET
c/o MountainNet, Inc.
Attn. Mr. Michael Digman
P. O. Box 370
Dellslow, WV 26531

Attachment E
Agenda
AdaNET Project Meeting

December 10, 1987

6:00 P.M. - 7:00 P.M.

- Specific responsibilities of each of three sponsoring agencies
- Review specific objectives for the combined effort
- Define specific goals for each of three sponsoring agencies
- Coordination between three sponsoring agencies
- Direction to contractor

7:00 P.M. - 9:00 P.M.

- Discussion of current AdaNET activities
 1. Outline of status report
 2. Marketing and Imaging
 3. Marketing Survey
- Project Management
 1. Expanded discussion of deliverables
 2. Accountability of contractor & sponsoring agencies
- Role of other government agencies
 1. Methods for incorporation of additional agencies
 2. Criteria for consideration
- Federal Advisory Panel
 1. Role of Panel
 2. Criteria for Membership
- Technology Advisory Council
 1. Role of Council
 2. Criteria for membership
- New Business
 1. Next Scheduled meeting

AdaNET[®]

The Advanced Development Network
For Ada[®] Software Applications



AdaNET is a cooperative effort between government, education and the private sector to create a resource that will aid in facilitating the wide-spread use of Ada technology.

AdaNET will be a gateway to Ada and advanced software technology information. It will be a resource to aid in the identification and acquisition of information needed at all levels of expertise.

AdaNET will serve as a test bed for new Ada training methodologies and will be accessible via established telecommunications linkages with existing government, educational and commercial networks.

AdaNET will provide continuous refinement of Ada software and software engineering information and technology, and will provide a system for identifying and acquiring needed information.

AdaNET will serve as a source for advice relating to specifics of the Ada language and its usage, and what tools are essential for good software development practices.

By organizing and enlarging the scope of knowledge available and the ease with which it may be obtained, AdaNet can give business, industry, government, and the individual many of the tools needed to make a transition into the Ada culture.

AdaNET[®] is a registered trademark of MountainNet, Inc.
Ada[®] is a registered trademark of the U.S. Government (AJPO)

AdaNET®

The Ada® Soft-Where-House



AdaNET is a facility providing centralized accumulation of Ada information and technology.

This free flow of information will allow advances in technology that have been made, primarily through government funded development, to be disseminated throughout all levels of the private and public sectors.

With a gateway such as AdaNET, with the various attendant services that will be offered, the road will be opened to rapid advancement in many fields.

Some of those organizations that will benefit almost immediately include:

- Traditional industries faced with the need to automate in order to re-establish a competitive position in the international marketplace

- The academic community for the education of Ada trainers and software engineers, as a tool for research and development, and for academic/industry transfer
- Commercial developers concerned with applications and "embedded" software for commercial products development
- Large and small industries exploring the transition to Flexible Computerized Manufacturing (FCM)
- NASA, the U.S. Department of Defense, and the U.S. Department of Commerce
- Contractors developing Ada systems and programs for Federal agencies

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Ada® is a registered trademark of the U.S. Government (AJPO)

AdaNET®

Value-added Services and Products



AdaNET will offer a wide array of services and products designed to enhance the application of Ada® technology at all levels of expertise.

AdaNET Information Services will include:

- On-line Repositories Access
- Taxonomic Classifications
- Repository Reproductions
- Easy to Use Topical Search Categories
- Electronic Bulletin Boards
- User Communications
- AdaNET Telephone Help Line
- Ada "Starter" Packages
- Services and Products Publications
- Validation and Verification
- Documentation and Tutorials
- Libraries of Reusable Modules
- Life Cycle Identification

Collateral and Supplemental Products and Services will include:

- Seminars and Workshops

- Development and Management Tools Needed to make Optimal Use of Ada Software
- Industry Transition
- Proprietary Software
- Special Interest Groups
- Specialized Libraries
- AdaNET Publications and Newsletters

Those interested in Ada technology and its applications will be able to acquire the information available from AdaNET through a variety of methods; telephone, telecommunications, electronic media or by hard copy.

AdaNET is an interactive partnership. AdaNET will identify new information on Ada technology, provide access to it in usable formats, and support its transfer to any interested party. This will create a wide-open forum that will provide a free flow of information in an active, rapidly expanding field.

From government agencies to private business, AdaNET will be a dynamic tool in working with Ada technology and the application of this powerful technology.

Chapter 3

Business Plan

3.1 Executive Summary

This plan describes the development of AdaNET, the purpose of which is to disseminate software engineering and Ada technology and aid in the transition of this important technology. Since Ada's first commercial availability in 1982, there has been continual development of Ada applications in both the public and private sectors, nationally and internationally. MountainNet, Inc., is developing AdaNET as a means to capture and reuse the increasing volumes of Ada software technology and related information being generated by public sector activities. Through value-added information services and reusable Ada software, AdaNET will offer technology solutions not previously available. AdaNET development is supported jointly by the Technology Utilization Division (TU) of National Aeronautics and Space Administration (NASA), the Ada Joint Program Office (AJPO) of the Department of Defense (DoD), and the Office of Productivity, Technology and Innovation (OPTI) of the Department of Commerce (DOC).

3.1.1 The Company

MountainNet, Inc., is a communications and software engineering company formed in 1983 to provide services throughout West Virginia. MountainNet currently serves the government, commercial and educational communities within the state. In 1985, MountainNet recognized the vast potential market for Ada related services. The DoD developed the Ada computer language for mission-critical systems, but Ada technology seemed to have broad potential beyond the defense community. This potential, plus the fact that very few companies existed with established expertise in Ada technology, combined to present an excellent market opportunity.

In response, MountainNet developed AdaNET, a service designed to address the need for specialized software and information for the software engineering and Ada technology market, and submitted a unique proposal to NASA to support its development.

3.1.2 MountainNet's AdaNET Services

MountainNet is using its telecommunications, information distribution and Ada technology expertise to develop a system that will coordinate information from a multitude of sources for consolidated direct access by AdaNET subscribers. Services will include access through a variety of media to:

- Ada software;
- Information about that software;
- Communications among Ada professionals;
- Retrieval systems for general Ada related information;
- Catalogs of government sponsored Ada programs and technology;
- Catalogs of existing software engineering/Ada products and services;
- Third party services representing areas of Ada related expertise.

An important part of the AdaNET system will be the development and on-going support of a Dynamic Software Inventory (DSI), a library of reusable Ada components and their associated life cycle products. Specialized value-added services to encourage reuse of this software will also be provided. These services include software classifications, testing, performance metrics, documentation, tutorials, and quality ratings. Ada repositories currently exist, but the incorporation of these value-added services and accessibility to a wide market base make the AdaNET system unique. MountainNet is entering this market at an ideal time, when there is recognized need and currently no major source of competition. AdaNET will complement and augment existing related public and private sector services.

Through AdaNET, MountainNet will capture for reuse the growing amount of Ada technology being developed for NASA and DoD programs. This technology will be collected, organized, evaluated, and made available to the private sector to encourage transition to use of Ada technology. MountainNet will also identify current activities within various government organizations to lessen potential duplication of effort. Another goal of the AdaNET system is to apply acquired software technology to Computer Integrated Manufacturing/Flexible Computer Integrated Manufacturing (CIM/FCIM) and industrial automation activities in the United States.

The revenue structure will utilize both standard subscriptions and incremental fees. MountainNet will provide quality information at affordable rates to encourage widespread usage of software engineering and Ada technology. AdaNET rate structures will be based on high volume usage. MountainNet's service goal for AdaNET is to provide reliable information services at cost effective rates.

3.1.3 The Market

Markets for AdaNET software and information services include:

- Existing Ada community
- International software industry

- Manufacturing and automation communities
- Educational communities
- Government organizations

Initial technology transition efforts will be directed to the existing Ada community, as well as that portion of the traditional software industry seeking entry in the software engineering and Ada marketplace.

Many of the services offered through AdaNET will be of use to all of these target user groups, and additional services will be offered to cater to other specific user communities. AdaNET services will be offered in many forms, including seminars, workshops, professional consulting, and the DSI with its supporting information. This information will be distributed through a variety of methods, including on-line, CD-ROM, diskette, and print.

The market for Ada products will be several hundred million dollars in 1988, and is expected to exceed one billion dollars by 1991, surpassing four billion dollars by 1995, according to a survey conducted by IRDI. The most immediate potential user base is the current software engineering and Ada community. Preliminary market surveys conducted by MountainNet indicate that there is interest and perceived need for the types of services to be offered through AdaNET.

3.1.4 Financial Projections

Support for AdaNET development is being provided by a subcontract from the NASA - Johnson Space Center (JSC) through the of Houston - Clear Lake (UHCL). Full implementation of planned services will enable research and development of computer based resources and value-added services, facilitate acquisition of necessary computer and network resources, and support aggressive technology transition plans. Full financial projections are contained in section 3.7 of this document (page 96).

3.2 Background

MountainNet, Inc., a West Virginia business, was incorporated in 1983 to provide telecommunications and software engineering services. MountainNet currently maintains 17 dial-in nodes across the state, with internetwork linkages to the West Virginia Network for Educational Telecomputing (WVNET), a state supported network, and the commercial international Telenet network. The MountainNet network is used to access a variety of computer hosts and other networks by governmental, commercial and educational users of on-line information services. For example, MountainNet provides telecommunications access to a computer hosting an on-line information system supported by the West Virginia Department of Energy. The Software Valley Bulletin Board, a free public access electronic bulletin board service, is made available through a cooperative effort of MountainNet and MPL Corporation, an affiliated computer services corporation.

MountainNet is entering the software engineering and Ada technology information services market with development of its AdaNET system. Through AdaNET, MountainNet will collect and disseminate software and information in the fields of software engineering and the Ada computer language. Interest in Ada technology has rapidly increased in both the public and private sectors, nationally and internationally, since Ada's first commercial availability in 1982. AdaNET's purpose is to encourage greater growth of the Ada community in the private sector, as well as to capture for reuse the vast, ever increasing amounts of Ada software and related information being generated by public sector activities. The information available through AdaNET will be offered with accompanying value-added services, resulting in a source of information which will be unique in the Ada market.

MountainNet has found that several major barriers exist for new companies trying to enter the Ada technology marketplace. Critical information about training and software engineering/Ada technology is difficult and expensive to obtain, and very few support services exist to aid in the collection and use of this information. In addition, the rapidly expanding base of public domain Ada software has not been organized effectively for widespread distribution and reuse. Such information has primarily existed in disparate centers serving focused user bases, with little information sharing between such activities. There is a market for efficient, reliable access to this information by both the existing Ada market and by new market entrants. AdaNET will provide such access.

An important part of AdaNET will be the development and ongoing sup-

port of an Ada software library, with accompanying specialized services to encourage reuse of this software. This library will be unique to the industry. Only recently has the software industry as a whole recognized the need for technologies supporting reuse of software. Current activities in developing software reuse technologies and methodologies are primarily government supported. As these new technologies become available, MountainNet will apply them the AdaNET reusable software library.

With software life cycle costs continuing to increase, and the need for new software systems in both the public and private sector rising each year, the demand for more efficient technologies to manage this "software crisis" has never been greater. Through AdaNET, MountainNet will provide a central information source for such emerging technologies, and will use these technologies in building its own reusable components libraries. Anyone producing software engineering or Ada software products in this market is a potential AdaNET user. AdaNET should also encourage new entrants into the software engineering and Ada market by making the technology more accessible, particularly in the area of CIM/FCIM software development.

AdaNET will provide its user base with the following:

- A telecommunication linkage for government, academic and commercial entities;
- A clearinghouse of information for professional, educational, and current events news;
- Contracting information to encourage greater competitiveness in the software engineering and Ada marketplace;
- Access to other market participants for:
 - Potential teaming opportunities
 - Expertise in a variety of areas related to software engineering and Ada technology
- Access to Ada software libraries, aiding users in software reuse;

AdaNET will be directed initially to two target markets: the existing Ada community; and the traditional software development community seeking entry into the Ada market. The buyers of AdaNET services will include:

- Software engineers and developers
- Software managers
- Contractors and subcontractors
- Government agencies
- Educational communities

MountainNet currently has 12 full time equivalent (FTE) personnel, of which ten are assigned to AdaNET. During the next phase of the project, MountainNet will add to its internal technical and technology transition staff, reflecting the shift from initial project planning to full scale AdaNET implementation. MountainNet will add approximately six people during the next year. Long term growth of the company is anticipated to peak between 20-30 FTE personnel.

MountainNet has maintained controlled growth by subcontracting services whenever possible. This approach has allowed a high degree of flexibility in response to market demands. MountainNet will subcontract with a variety of companies representing areas of expertise essential to successful AdaNET development. MountainNet is currently working with eleven companies and organizations, and is discussing formalizing relationships with several major technology and industry leaders, thus broadening the base of available resources.

3.3 The Market

This section is an initial marketing plan for the AdaNET. It discusses the current marketplace, presents results of an initial market survey and describes the beginning implementation plan for AdaNET.

3.3.1 The Software Engineering and Ada Marketplace

This section discusses the use of Ada in a software engineering environment, describes the current Ada marketplace and offers a view of Ada as applied to the commercial sector of the economy.

Ada in a Software Engineering Environment

Ada is a tool for software engineering in embedded computer applications. Although initially defined as a language for DoD mission-critical computer resources, Ada is being recognized as a language which has much broader applications. For example, most process control systems in place on factory floors require the same degree of tightly controlled development as DoD applications. Implementation of object-oriented design, information hiding and packaging concepts using Ada is appropriate for the development of the automated factory of the future.

One of the most critical elements of Ada is that it encourages the use of good

software engineering practices. When used properly, Ada can reduce costs and enhance the engineers' ability to reuse components in new systems. The AIS will provide necessary information that will aid in the proper use of software engineering principles.

While originally developed for embedded systems development, similar benefits from use of Ada are being experienced in development and support of applications software, such as management information systems, database systems, and software tools.

The Current Ada Marketplace

The initial Ada technology market was completely driven by the United States government, and more particularly, by DoD demand. Development of the Ada language was sponsored by the DoD in an effort to control software costs in vital defense and weapons systems. Ada's development was intended to:

- Establish one standardized language that would be used by all DoD agencies in the development of mission-critical systems;
- Hold down the rising costs and improve the reliability of developing and maintaining software by encouraging good software engineering design;
- Encourage reuse of software by including features that would enhance the potential for reuse of software components.

The process of developing Ada, from its early specifications documents through the first commercial compilers, spanned the period from 1975 to 1982. Hence, the Ada market is just emerging from its infancy. Major development efforts using Ada in the United States have been, for the most part, government sponsored activities. Internationally, the use of Ada in the commercial market has been more widespread; banking, telecommunications, and aerospace systems have been developed using Ada technology. One of the largest companies to adopt Ada early on was the Japanese Nippon Telegraph-Telephone (NTT), which began developing their software in Ada shortly after the first commercial compilers became available.

However, the market demand created by defense applications has been significant. A DoD directive issued in 1983 mandated that Ada must be used for all new mission-critical applications. In 1985, North Atlantic Treaty Organization (NATO) directed that all NATO-developed systems developed after January 1986 must use Ada. In 1986, a DoD directive expanded the use of Ada to all new weapons systems development. The defense market

for Ada applications alone generated more than 100 million dollars per year.

Three areas historically holding back Ada's widespread adoption were the lack of commercial compilers and tools for many popular computer systems, the general lack of trained professionals in the field, and the lack of technology and market information.

Ada use is rapidly spreading to the commercial applications market, now that its advantages in software productivity and reliability are being realized. Major applications in supporting real time control systems are being developed. Weirton Steel, in Weirton, West Virginia, is undertaking a 300 million dollar modernization project for new hot rolling mill technology that will use Ada as its control language. The development is being done by General Electric Corporation. Ada is also being used in the United States to program microwave ovens, commercial aircraft navigational systems, telecommunications, database management systems, and many other applications.

The government market continues to drive the process of Ada's adoption by the world's software industry:

- In December 1987, NASA awarded a 1 billion dollar contract to Boeing Corporation for the development of a space station, to be completed in the mid-1990's. The software will be written in Ada and is estimated to require 10.5 million lines of code.
- A 508 million dollar contract was released by the DoD in January, 1988, to Martin Marietta Corporation for the development of the Strategic Defense Initiative (SDI) National Test Bed. This project will be developed using Ada.
- The Software Technologies for Adaptable, Reliable Systems (STARS) has solicited proposals for major research to be conducted simultaneously by three major prime contractors for developing new technologies that will encourage software reusability in Ada. STARS has indicated that a centralized software repository to coordinate the results of this research is needed.
- The Federal Aviation Administration (FAA) (Department of Transportation) has chosen Ada as its standard development language.

Recent commercial sector activities are also significant:

- Ada compilers and tools are proliferating; there are currently 123 commercially available compilers listed in the Ada Information Clearinghouse (AdaIC), which run on the most common mainframe, mini and micro computers.

- Ada education is also expanding, with Ada and software engineering courses being offered at many small colleges, as well as at most major universities. The number of companies providing Ada education for the existing professional market has also increased.
- The Software Productivity Consortium (SPC), a research consortium established by the nation's largest defense and aerospace companies to develop new automation, knowledge based systems, and reuse technologies, is using Ada as its primary development language.
- Space Industries, Incorporated, a Texas company which proposed the development of the Industrial Space Facility (ISF), a parallel program to NASA's space station, is using Ada technology to support its development.
- A study released by International Resource Development, Incorporated (IRD) in December, 1986, has determined that Ada market opportunities for 1988 total several hundred million dollars. Such growth is introducing many newcomers to the Ada marketplace. The need for skilled Ada software engineers far exceeds the number currently available. Major corporations and leading defense contractors have undertaken internal training programs to develop enough expertise to meet their current contract demands. Newcomers to the market still have extreme difficulty locating educational and professional information, gaining access to currently existing technology and compilers, and finding contracting and subcontracting opportunities.

It is apparent that the software engineering and Ada technology market is on a steep upward climb. The government market alone will continue to support steady growth, thus creating a base of long term stability in the Ada market. However, significant accompanying growth in private sector use of Ada is also probable, as the use of software engineering principles become more common and advantages in real cost and reliability savings are realized. IRD's study indicates that the market for Ada technology in 1991 alone will have grown to more than a billion dollars.

3.3.2 Market Trends

AdaNET's immediate markets are the existing Ada community, and companies making entry to that community. New companies will continue to enter the market as the government demand for Ada software continues to grow and as the cost savings of using Ada technology are realized. Such savings include reduced life cycle costs, increased software reliability, and

savings through reuse of software components. The languages and technologies used in the past are now unable to meet the growing demands for larger, more reliable, longer term software solutions. Companies are finding Ada an attractive alternative.

The heightened emphasis on interconnectivity and standardization in all facets of communications is causing many companies to favor use of the standardized Ada language. With the shift to Ada technology to support the government market, it is becoming more cost-effective for government software producers to use Ada for all their applications.

As more software companies increase their competitiveness by adopting Ada, others will be forced to explore the transition to the Ada market in order to maintain a competitive market position or even to remain in the market at all. To support this transition, developers are seeking sources of software engineering/Ada related technology, educational, and market information. In spite of radically increased use of Ada, such sources are still scarce. To realize the advantages of software reuse encouraged by software engineering/Ada technology, developers are seeking new tools, design and evaluation methodologies, and access to the millions of dollars of government developed Ada software that is in the public domain.

3.3.3 Market Participants

Current products in the Ada market are summarized as follows:

- Ada Compilers
- Applications Software (e.g., CRI's Relate 3000 relational database system)
- Customer Specific Applications (e.g., Weirton Steel's hot rolling mill)
- Software Development Environments (e.g., CASE products)
- Computers (e.g., Rational computers)
- Educational Materials
- Metrics (e.g., McCabe and Associates, Autometrics)
- Newsletters (e.g., Ada Strategies, AdaData, AdaIC)
- Seminars (e.g., EVB Software Engineering, Texel Putnam Associates)
- Tools (e.g., program design languages, configuration management)

While all the Ada product areas listed above represent potential users of AdaNET services, MountainNet views the producers of Applications/Customer Specific Applications as the potentially largest group of AdaNET users. MountainNet is conducting an ongoing market assessment as part of the planning to provide continuing refinement to the Technical Plan and Rev-

venue Structures reports. The following questions are being researched for each of the service areas listed:

- How many companies are producing software engineering and Ada training materials?
- How is the service made available to users?
- What is the anticipated growth in this market by number of market participants and total market share?

These statistics will be used as the basis for final revenue projections, by applying service revenue structures to each of these markets. Independent market growth projections in each area, coupled with final results of MountainNet's own market studies, will allow more accurate predictions of growth in each service sector. Current projections are made on baseline minimum use for each service area in the current market environment.

3.3.4 Market Composition

MountainNet has identified several major professional areas represented within each of its potential market segments:

- Software Engineers/Developers
- Managers/Administrators
- Educators
- Applications End Users

The initial market survey conducted at Ada Expo '87, indicated that these individual user communities have interests in specific service areas:

- Software Engineers/Developers already working with Ada technology were interested in software engineering methodologies, Ada specific metrics, reusable software, and Ada faceted classifications for reuse. They had little interest in Education and Support, or Contract Opportunities/Market Trend information.
- Those representing Administrative or Business oriented functions within their organizations, whether governmental or commercial, registered interest in services providing contracting/subcontracting information, current events, market trends, governmental activities with respect to the use of Ada, and information about companies and products in the Ada market. They had little interest in technically oriented services.
- Educators, fewest in number of those groups represented in the sampling, indicated the strongest interest in technically oriented informa-

tion, such as: Ada faceted classifications for reuse; software engineering methodology; topical search categories for reuse; and Ada tutorials. All other areas registered median interest, with the exception of contracting, products, and telephone help line, which were of little or no interest.

- The last category includes potential Manufacturing/Industrial communities examining Ada technology as part of an overall advance technology solution to aid in their productivity, competitiveness and reliability. Areas of interest to representatives actively involved in the development Ada applications include: information about current industrial applications, educational and professional information, and information about companies possessing specific areas of Ada technology expertise.

This survey, along with more in-depth inquiries, is being distributed to a much broader sampling of both the Ada and non-Ada communities. For a more detailed analysis of the data collected at the Ada Expo, see appendix A.

3.3.5 Market Segments

MountainNet has identified five separate market segments which represent the key areas in its implementation strategy:

- Current Ada market participants
- New entrants to the Ada market
- Educational institutions
- Government organizations
- Industrial/Manufacturing

The current Ada market represents the most immediate market for AdaNET services. MountainNet is gradually becoming established in that community, through activity in professional organizations and through MountainNet's expanding base of government contacts. Based on preliminary surveys, the professional Ada community will comprise the initial base-line of services planned by AdaNET. Particular interest has been expressed in reusable software components and supporting value-added services, professional papers, and general information services such as market trends and contract opportunities. Development of these services must occur before expansion into later markets, such as the industrial and manufacturing markets.

The educational community does not represent a potentially high level revenue base. However, those colleges and universities that have established bases of Ada expertise will be some of AdaNET's most valuable sources of new research, development and emerging technology. For those institutions trying to gain Ada technology expertise, AdaNET's purpose will be to provide as much high quality, low cost information and support as possible, as they begin to incorporate Ada and software engineering into their curriculums.

The government market represents a highly stable, proactive environment for AdaNET's services. While AdaNET's stated purpose is the transfer of software engineering and government developed Ada software to the private sector, another implicit role that has emerged for AdaNET is to inventory available software within various government agencies. Much time has been spent in AdaNET's planning phase to determine the scope of existing Ada and software engineering information and related projects in progress at various NASA field centers. In discussions with DOC, NASA, and DoD organizations, it has become apparent that there is duplication of efforts within these organizations. AdaNET will provide a means by which these agencies can communicate to coordinate their Ada related activities. This information can be shared, allowing faster development and greater technological advances.

Entry into the industrial/manufacturing market will require a more prolonged effort. Significant pre-market education will probably be required for individual communities to see the direct advantages of applying software engineering/Ada technology to their specific applications. AdaNET will provide educational and consultant support for successful long term software engineering/Ada technology transfer in such areas as Paperless Order Processing (POP), Just In Time Inventory (JIT), CIM/FCIM, and other real time control systems.

3.3.6 Distribution Media

AdaNET services will be delivered through a variety of distribution media. On-line computerized AdaNET services will be available internationally through MountainNet's network, as well as through internetwork gateways to commercial, educational and governmental telecommunications carriers. Other distribution formats will include hardcopy, magnetic tape, diskette and CD-ROM. A centralized point of distribution will be established for each medium. Wherever possible, MountainNet will seek alternate distribu-

tion channels, to increase the overall market base for its services. MountainNet is currently in discussions with distributors of CD-ROM information about potential use of existing distribution channels for AdaNET's CD-ROM based services. Similar possibilities will be examined in the diskette duplication market.

3.3.7 Complementary Services

Currently, there are few sources for the information services that MountainNet will be providing. Other sources of related information do exist, but those services either do not provide the same kinds of value-added services, or are limited in the range of information provided. MountainNet views the organizations listed below as potential partners in building AdaNET resources and providing additional complementary resources to the AdaNET user base. It is a goal of the AdaNET project to form co-operative relationships with any organizations that can provide valuable services to AdaNET subscribers. MountainNet will seek to provide services that complement and augment existing services rather than duplicate their efforts.

Publications and Bulletin Boards:

AdaData: A monthly publication by IRD provides information about market trends and commercial development in Ada software, services and equipment.

Ada Information Clearinghouse (AdaIC): An activity sponsored by the DoD AJPO, publishes a quarterly newsletter with information primarily about DoD related activities, as well as current developments in the Ada compilers and software tools market, and current events updates. Newsletters and other information are made available on a PC-based bulletin board system operated by the AdaIC. Since both AdaNET and the AdaIC are projects sponsored by the AJPO, both groups will work to coordinate their activities to avoid duplication of effort. Discussions are in process now.

Software Engineering and Ada Database (SEAD): An on-line database service operated by UHCL for JSC, NASA. As part of MountainNet's Phase I and II Statement of Work with UHCL, MountainNet has investigated ways in which AdaNET can augment the information contained in SEAD, and

explore how SEAD could be made available through MountainNet's developing AdaNET network.

Ada Strategies: A monthly periodical by Cutter Publications providing information about the commercial and governmental Ada market, current events and trends. Ralph Crafts, editor of *Ada Strategies*, has recently signed a teaming agreement on behalf of his company, Software Strategies and Tactics, with MountainNet to provide marketing support to MountainNet for AdaNET development. These services may include general Ada market assessment, evaluation of AdaNET charges, services evaluation, and target marketing.

Software service activities (providing access to public domain software):

Alde Publishing: Operating a CD-ROM based service with duplications of the Ada Software Repository (ASR) and other public domain software, primarily serving the Minnesota market area, where its major users are Honeywell and CDC. No value-added functions are provided in analysis or support of the software.

Initial discussions with Alde Publishing have indicated that Alde would be highly interested in serving as a distribution channel for the CD-ROM services MountainNet will be establishing.

Army White Sands Ada Software Repository (ASR): Located on the Army's SIMTEL-20 node of the MIL-NET, and serving as the major clearinghouse for public domain DoD Ada software. The service provides on-line access to subscribers for a \$2000 annual fee. Remote software requests from accounts on the Defense Data Network (DDN) are serviced, as are remote requests from educational networks. SIMTEL-20 and DDN accounts are limited to DoD organizations and contractors. Due to resource limitations, restrictions are set on the volume of software transmitted per request. Low level testing is performed on software, with no verification, metrics, or evaluation for potential reusability of subcomponents being performed. Due to the volunteer nature of much of the service, there is typically a backlog of duplication requests.

Through discussions with Richard Conn, originator of the ASR, it was discovered that AdaNET can service the private sector with access to the the Ada software information that the ASR is providing to the defense market. ASR is currently receiving more electronic and written requests for software than it can effectively provide. Many of the incremental services AdaNET will offer, such as verification and metrics applications, are not expected to become standard ASR offerings. MountainNet currently has copies of the ASR as well as other software collections, such as the Common Ada Missile Packages (CAMP), available on its computer systems.

Computer Science Management and Information Center (COSMIC): NASA's repository for collected NASA software system that are general enough for redistribution to the public and private sectors. Both COSMIC and AdaNET receive funding from NASA's TU division. NASA TU has stated the need for cooperation between AdaNET and COSMIC. One way in which AdaNET could work with COSMIC is to provide on-line access to COSMIC's software directory, hence broadening COSMIC's marketing channels. Discussions are being held with John Gibson, COSMIC Director, about possible cooperative relationships. A Memorandum of Understanding between University of Georgia (COSMIC's operator) and MountainNet is currently being put in place, to identify service areas addressed by each organization and specific areas of interaction.

Science Applications International Corporation (SAIC): Currently under contract to STARS to provide no cost private sector access to ASR and Naval Ocean Systems Command (NOSC) software. This software is made available on magnetic tape. No value-added functions are provided in analysis or support of the software.

Proprietary Ada Software Libraries:

EVB Software Engineering's Generic Reusable Ada Components for Engineering (GRACE): Some proprietary Ada software libraries are now being marketed, of which GRACE is the most widely known. The components supply fundamental data structures and functions, indexed by a taxonomy refined from that proposed in the book, "Software Components

with Ada", by Grady Booch. The components are tested, supported, and are highly portable. Costs for the system depend on the buyer's host computer. MountainNet believes that more companies will enter the reusable components market as that market matures.

3.4 Market Strategy

Based on the five key market segments previously identified, MountainNet has chosen two specific areas in which to establish its initial AdaNET service base:

- Ada Information Services (AIS), technology information services
- Dynamic Software Inventory (DSI), Ada reusable software and associated life cycle products

MountainNet is utilizing the following strategies to develop its technology base and gain exposure to the most current trends and developments, as well as to become integrated into the Ada culture:

- **Identification of existing NASA technologies:** This includes collection of publications and standards produced by various NASA field centers and divisions, identification of related projects and technologies, and communication with the individuals involved in such activities.
- **Development and broadening of AdaNET's support infrastructure:** MountainNet is creating organizations for the formal interaction of public and private sector entities with AdaNET. These organizations are the Federal Advisory Panel, the Technology Advisory Council, and the Business and Industry Council. Discussions with representatives of other NASA organizations, as well as other government agencies, will be ongoing. As part of this effort, AdaNET is participating in NASA's Software Management and Assurance Workshop and in the National Bureau of Standards' FEDMAIN working group. As a result of continuing discussions with the executive council of the ACM's SIGAda, the council has indicated interest in using AdaNET as their electronic communications medium.

MountainNet approach in developing AdaNET revenue structures is to offer affordable, general baseline services to a wide user audience and to provide

incremental services at additional cost for high end or specialized user requests. The three major goals of this fee structure are to be able to provide a large amount of information across a wide variety of media, to keep individual user starting costs low, and to distribute part of the high costs of expensive services across other low cost categories.

In order to stimulate AdaNET customers to become new sources of Ada technology for the AdaNET information base, the AdaNET services information group will develop special incentive programs. One possibility would be a system of AdaNET credit points. Users who submit new, reusable objects or refinements to existing objects could be awarded points based on the quality and quantity of their submissions. Point values could be periodically adjusted to reflect changing supply and demand needs in the inventory of reusable components. For example, bonus points could be offered during a specified time period to users who submit a particular component lacking in the DSI but in high demand from subscribers. These points would make the holders eligible for special recognition, additional benefits, and special services. This creative method of soliciting high-demand components has the potential to make AdaNET highly responsive to user needs.

In order to attract the professional markets previously identified, the AdaNET system must be established as a highly professional, "cutting-edge" technology service. To achieve this, AdaNET will demonstrate easily accessible information that is truly of value to computer professionals. Presentation of the DSI will emphasize the wealth of software available, as well as the inherent value of the AIS to the software development process. Presentation of AdaNET services will be of high quality and will set AdaNET apart from current information services.

MountainNet will promote AdaNET services through:

- Attendance at related major trade shows and conferences.
- Direct marketing to:
 - corporate organizations;
 - professional organizations;
 - consortia, such as the Software Productivity Consortium (SPC).
- Expanded technology transfer activities with additional government organizations.
- Survey and advertising materials in professional and trade publications.

- Utilization of existing distribution channels for the types of media provided by MountainNet through AdaNET.

3.5 Products

3.5.1 Description

Implementation of AdaNET services will continue over a two year period, with new services being phased in as other services are under development. The following is a listing and description of services currently planned.

Description	Target Service Date			
	Low Level	Prototype	Standard	High-End
Dynamic Software Inventory	08/88	12/88	04/89	
Reusable Ada Software	05/88	08/88	12/88	04/89
Other Life Cycle Objects				
Documentation	05/88	08/88	12/88	
Metrics		09/88	12/88	04/89
Profile Information	08/88	10/88	12/88	02/89
Reuse Database/Taxonomy		08/88	12/88	04/89
Tutorials				
AdaNET Information Services				
User Forums	05/88	07/88	10/88	
AdaNET Bibliographic System	04/88	07/88	10/88	
Educational Materials	03/88	07/88	09/88	
Electronic Communications	NOW		08/88	
Full Text	04/88	06/88	08/88	
Directories/Publications	06/88	10/88		
Other Repositories & Services		06/88	08/88	
Professional Support				
Consultant services			02/89	
Seminars and Workshops			07/88	

3.5.2 Dynamic Software Inventory (DSI)

The Dynamic Software Inventory (DSI) will provide access to both software and associated life cycle products, along with value-added services relevant to that software. Its design will allow users to view these objects across and within the phases of the life cycle. MountainNet uses the term Dynamic Software Inventory to distinguish this service from that of a "repository". Like a repository, the DSI will store reusable components. However, unlike other repositories, The DSI will also store other life cycle products associated with the reusable components, such as requirements documents, design documents, and test plans. Also, the contents of the DSI will undergo constant improvement through the application of value-added services that include quality and performance testing, portability reports, and extended profile information. Furthermore, the DSI will contain built-in mechanisms by which users of the reusable components will be encouraged to make refinements to the components and resubmit them to the inventory.

Reusable Ada Software: An inventory of public domain Ada software from NASA, DoD, other government organizations, and private sector sources will be evaluated for inclusion in the DSI. Wherever possible, associated life cycle products will also be incorporated in the DSI.

Other Life Cycle Objects: In later phases of the project, the inventory of reusable components will be expanded to include other objects from the software life cycle, such as requirements documents, test plans, and software specifications.

Documentation: Standard documentation accompanying software components and related life cycle products will be stored in the DSI. Standards or guidelines under evaluation for possible adoption include NASA's DID's (Ada version) and MILSTD-2167A. For standard life cycle and AdaNET specific documents, AdaNET developers are considering the adoption of the SGML ISO standard to develop Document Type Descriptions (DTD) representational markup.

Profile Information: Each inventoried software object will have an associated profile. Current profile attributes include abstract, author, hardware/OS requirements, size, documentation status, portability report, etc.

Reuse Database/Taxonomy: Objects in the DSI will be stored in the reuse database using a faceted classification scheme, which will allow for a flexible design. The design of this database will be independent

of the data model used to ensure that it will not be constrained by the current "state of the practice".

Tutorials: This consists of instructional information on the use of the DSI, and on the use of inventoried components.

3.5.3 AdaNET Information Services (AIS)

User Forums: A variety of bulletin board services, each relating to a general topic area will be developed. Current events, Special Interest Groups (SIGs), discussion forums, news, and product information will be offered.

AdaNET Bibliographic System (ABS): A bibliographic retrieval system for texts of interest to the software engineering/Ada community will be available. Information will be accessed by key field/key word search categories, including article and periodical/publication references and abstracts.

Educational Materials: Access to or information about educational books, video courses, overhead slide presentations and CAI tutorials and other types of educational materials about software engineering and Ada will be provided.

Electronic Communications: Standard electronic mail and document transfer services are available.

Full Text Information: Full text information relevant to software engineering, Ada and related technologies in the AdaNET library, that MountainNet is authorized to make available to AdaNET users, will be provided.

Directories/Publications: Printed information about software objects in the DSI, and regular user updates concerning new and/or improved AdaNET services and activities will be available.

Other Repositories and Services: Information about known public and private software repository activities throughout the country for both Ada and non Ada software will be provided. Such repositories include the ASR, and NASA's COSMIC.

Consultant Services: MountainNet's staff and those companies comprising the AdaNET support infrastructure will be available via AdaNET for specialized software engineering/Ada technology consultant services.

Seminars and Workshops: MountainNet will sponsor workshops, working groups, and conferences.

3.5.4 Spinoffs

As the AdaNET system evolves, other spinoff services will be pursued. Such services include:

- Consultant services to aid manufacturers in their transition from traditional technologies to Ada based CIM/FCIM technologies.
- Consultant services to private sector organizations in their development of reusable software components inventories.
- Expansion to the international Ada technology market; AdaNET may be able to serve as a technology transfer medium for software engineering and Ada technology developed overseas to the United States market.

3.5.5 Revenue Classes

Three revenue classes are being examined. Some services will be offered on a subscription basis, where levels of services are available for fixed rate fees; these services are denoted by an "S" in the following table. Other services are offered for incremental fees, denoted by an "I", allowing users to "pay as they go" for services not standard to their regular subscriptions. A third potential structure is full purchase of product, denoted by a "P", in which users buy a working application or other specific AdaNET product. The revenue classes listed below are for discussion purposes only at this time; final recommended revenue structures will be provided in the final report on Revenue Structures, which will be reflected in the final draft of this business plan. Services will be provided across a variety of media, which include: on-line computer access; CD-ROM distribution; magnetic tape; diskette; hardcopy; misc (including Teleconference and video media); and live support.

Revenue Classes for AdaNET Services

Description	Distribution Medium						
	On-Line	CD-ROM	Tape	Diskette	Hardcopy	Misc.	Live
Dynamic Software Inventory	ISP	SP					
Ada Software Components	IS	SP	P	PS			
Documentation	IS	SP	P	PS	P		
Metrics	IS	SP	P	PS			
Profile Information	IS	SP			P		
Reuse Database/Taxonomy	IS	SP					
Tutorials	IS	SP	P	P	P		
Information Services							
User Forums	IS				S		
Bibliographic System	IS	PS			PS		
Educational Materials	IS	PS	P	PS	PS		
Electronic Communications	S						
Full Text	I	PS	P	P	PS		
Directories/Publications					PS		
Outside Services	S						
Professional Support							
Consultant services							P
Seminars and Workshops							P

I = Incremental

S = Subscription

P = Purchased

3.6 Management

MountainNet's management team for the AdaNET project includes:

James W. Rautner	— Project Director
Donn Philpot	— Technical Director
Kevin J. Dyer	— Strategic Planning
Linda K. Braun	— Contract Administrator

3.6.1 James W. Rautner

Mr. Rautner's background includes a B.S. in computer science, coupled with a strong business background. He worked with software installations at various West Virginia educational institutions; this work included complete user analysis, software installation, customization, and end user training. He has served as consultant and troubleshooter in support of MPL Corporation timesharing clients, and is working as an analyst in the design and development of several interactive business products being developed by MPL. He is active in the marketing efforts and market research of MPL services, and has been instrumental in developing current corporate marketing approaches and product evaluations. As Vice President of MountainNet, he is heavily involved with the strategic planning and long range market analysis of new products and services development.

His computer languages and software experience includes: Ada, Pascal, FORTRAN, LISP, VAX Macro, BASIC, POISE, TROFF, LaTeX, Runoff, DCL, CLI, VAX/VMS, AOS/VS, MS-DOS, EDT, SED, EMACS, Wordstar, Calcstar, 20/20. Computer hardware experience includes Digital Equipment Corporation (DEC) MicroVAX, VAX 11/750 and 11/780, Data General MV/8000 series, and various PC compatibles.

Presentations

- "Overview of Ada Language Technology"; Association of System Managers, Pittsburgh Chapter, November, 1986.
- "Telecommunications for 'Non-Tech' Businesses"; Cheat Lake Rotary, February, 1987.
- "Communications and Business Resource Identification"; North Central WV Chapter, Software Valley, March 1987.

3.6.2 Donn Philpot

Mr. Philpot has more than twenty-five years experience in computer software and software engineering. His background includes development of management information systems, embedded computer applications and business communications. Specifically, Mr. Philpot has experience in program management, marketing and sales management, and technical development and training management.

From 1963 until 1969, Mr. Philpot worked for the General Electric Company from computer operations to senior programmer. Significantly, Mr. Philpot was part of the team which introduced the first commercial time-sharing system in the country. From 1970 through 1980, Mr. Philpot was involved in various time-sharing and software business ventures where he gained experience in training, program management and software engineering. In 1979, Mr. Philpot re-joined GE as a program manager on NASA projects, especially the maintenance and enhancement of Landsat C software. Mr. Philpot moved to GE Corporate Headquarters where he acted as a staff consultant to various GE businesses, including manufacturing, robotics, aerospace and defense and power generation. In this capacity, Mr. Philpot was GE's corporate representative to the Ada Joint Program Office, and served on panels and committees to refine the STARS program and Federal Acquisition Regulations.

In 1983 Mr. Philpot joined the Software Engineering Institute as the Director of Affiliate Relations. In this capacity, Mr. Philpot was responsible for negotiating agreements between the SEI and over 130 affiliate companies. Following a brief period as the Vice President for Sales and Marketing for Tartan Laboratories, an Ada Compiler company, Mr. Philpot formed his consulting business. Mr. Philpot is currently serving in a technical capacity and advising the AdaNET program.

3.6.3 Kevin J. Dyer

Mr. Dyer (A.B.A., Accounting; B.S.B.A.; Management/Marketing, M.B.A., Finance) brings to the AdaNet project in excess of 25 years experience in management, marketing, and data processing project participation. Planning, project management, teaching, management, operations, system design, conversions, evaluations, and training have been his areas of concentration, coupled with extensive experience in supervision of personnel and production operations. His consulting experience includes the following:

Mr. Dyer was project manager and senior technical staff manager responsible for the planning, organizing and implementation of projects and tasks within the scope of a Federal contract with the Center for Disease Control; project team leader, financial, for several joint projects executed for the National Institute of Health (NIH) and Health and Human Services (H&HS); Account Manager, National Cash Register Company (NCR); director of patient services, Peter Bent Brigham Hospital in Boston; administrator, CFO & CEO for Ambulatory Group practice supervising over 100 employees and operations in multiple locations; senior systems analyst, responsible for installation, development, and conversion of ADP applications in the health care field; operations manager for New England based timesharing and telecommunication corporation. Specialist in financial systems and project management. Mr. Dyer has been project manager or co-Manager of over 150 projects in his professional career.

His systems experience includes: IBM 402, IBM/1440, IBM/1401, IBM/3081, Honeywell 1200 and 200 series, IBM 360/30 and 40, IBM 370/45 and 55, CDC 3600 and 6600, NCR 50, 100, and 200 systems, and IBM 34 and 36 mini's DEC PDP/8, PDP/11, VAX 11/750, 11/780 and DG Eclipse series in addition to a host of PC compatibles. Mr. Dyer has programmed in COBOL, FORTRAN, BAL, BASIC, RPG II, Neat/3, APL, EASY-CODER, COMPASS, FOCAL, and AUTOCODER and is familiar with most operating system and application (CP/M, DOS etc) tools.

Professional Activities (Partial)

- **Software Valley Corporation:** one of incorporators, served as treasurer and secretary to the Board of Directors.
- **Software Valley Foundation:** one of incorporators, served as secretary to the Board of Directors.

Both organizations are West Virginia state wide non-profit corpora-

tions dedicated to the development and education of the high-technology industry.

- **Small Business Network:** one of incorporators, presently secretary to the Board of Directors of this state-wide focus for small business in West Virginia.
- Member of numerous boards of directors
- Guest lecturer and case method team leader:
 - Harvard Dental School
 - Boston University Medical School
 - Yale University School of Public Health

Professional presentations are numerous and include a broad spectrum of organizations and subject matter.

3.6.4 Linda K. Braun

Contract Administrator

Education:

- Waynesburg College, Pa. Courses in Mathematics and Programing.
- Ohio Valley General Hospital School of Nursing - 3 Year
- Program in Nursing Administration and College Science Studies.

Brings to MountainNET, Inc. and the AdaNET project over 18 years experience in project and contract management, financial analysis and management of royalty, investment, and accounting functions of an international oil and gas well operation. Relevant experience includes contract management of over 100 producing wells with multiple investment streams and royalty planning and accounting functions. Responsible to the investment pool directors.

Independent business owner and operator of a small trucking company servicing the oil and gas industry. Using the equity built from this enterprise founded a service station as a vertical market support business. Both enterprises were successfully sold at a profit. This entrepreneurial experience has direct transference to the contract administration responsibilities of the AdaNET project in the "change agent" role from government to the private sector.

Linda maintains an active role in community affairs as follows:

- Member 5 year planning committee for a school district.
- Long range planning committee Treasurer school district.
- Member Board of Elections for the county.
- Musical director of multi-church Methodist district.
- Business manager of the Small Business Network, Inc.

3.7 Financial

The following pages detail MountainNet's projections for the first five years of the development of AdaNET. As can be seen, support for development of AdaNET services is provided by NASA. Revenue generating services are phased in early in the second year of development. By year three, a strong base of services will be available and generating approximately 30 percent of the total operating costs. By year four, NASA funding will account for less than 30 percent of the total AdaNET operating budget. By the fifth year, NASA funding will account for less than 10 percent of AdaNET's total operating expenses. Major cost items, as MountainNet moves into early implementation,

AdanET First Year Projections

Major Cost Elements	Oct. '87	Nov. '87	Dec. '87	Jan. '88	Feb. '88	March '88
Personal Services	18,072	19,352	23,426	21,601	20,613	33,860
Current Expense	24,074	22,710	33,491	30,842	33,000	33,000
Travel Subtotal	205	5,192	12,031	148	4,394	4,394
Outside Services	2,800	2,800	800	1,200	1,900	1,900
Research Equipment	0	0	0	0	0	4,500
WMU	8,667	8,667	8,667	8,667	8,667	8,667
WMU Research Corp.	0	0	0	0	0	0
Beckley College	3,333	3,333	3,333	3,333	3,333	3,333
Software Valley Corp.	7,500	2,000	2,000	2,000	3,375	3,375
Total Direct Costs:	64,651	64,054	83,747	67,790	75,281	93,029
Fee	3,233	3,203	4,187	3,390	3,764	4,651
Total Expenses:	67,883	67,256	87,935	71,180	79,045	97,680
Revenues						
NSA Contract	67,883	67,256	87,935	71,180	79,045	97,680
Software Services	0	0	0	0	0	0
Electronic Communications	0	0	0	0	0	0
Educational Services	0	0	0	0	0	0
Printing/Duplication	0	0	0	0	0	0
Consultant Services	0	0	0	0	0	0
Seminars/Workshops	0	0	0	0	0	0
Total Revenue:	67,883	67,256	87,935	71,180	79,045	97,680

ADAMER First Year Projections (cont'd)

Major Cost Elements	Apr. '88	May '88	June '88	July '88	Aug. '88	Sept. '88	Cumulative
Personal Services	33,860	33,860	57,130	57,130	57,130	57,130	433,163
Current Expense	33,000	33,000	36,000	36,000	36,000	36,000	387,117
Travel Subtotal	4,394	4,394	6,000	6,000	6,000	6,000	59,149
Outside Services	1,900	1,900	2,267	2,267	2,267	2,267	24,268
Research Equipment	4,500	4,500	20,000	20,000	20,000	20,000	93,500
WMU	8,667	8,667	10,000	10,000	10,000	10,000	109,336
WMU Research Corp.	0	0	0	0	0	0	0
Beckley College	3,333	3,333	3,333	3,333	3,333	3,333	39,996
Software Valley Corp.	3,375	3,375	3,000	3,000	3,000	3,000	39,000
Total Direct Costs:	93,029	93,029	137,730	137,730	137,130	137,730	1,185,529
Fee	4,651	4,651	20,659	20,659	20,659	20,659	114,368
Total Expenses:	97,680	97,680	158,390	158,390	158,390	158,390	1,299,898
Revenues							
NASA Contract	97,680	97,680	158,390	158,390	158,390	158,390	1,299,898
Software Services	0	0	0	0	0	0	0
Electronic Communications	0	0	0	0	0	0	0
Educational Services	0	0	0	0	0	0	0
Printing/Duplication	0	0	0	0	0	0	0
Consultant Services	0	0	0	0	0	0	0
Seminars/Workshops	0	0	0	0	0	0	0
Total Revenue:	97,680	97,680	158,390	158,390	158,390	158,390	1,299,898

AdanET Second Year Projections

Major Cost Elements	Oct. '88	Nov. '88	Dec. '88	Jan. '89	Feb. '89	March '89
Personal Services	57,130	57,130	57,130	65,700	65,700	65,700
Current Expense	36,000	36,000	36,000	41,400	41,400	41,400
Travel Subtotal	6,000	6,000	6,000	6,900	6,900	6,900
Outside Services	2,267	2,267	2,267	2,607	2,607	2,607
Research Equipment	20,000	20,000	20,000	23,000	23,000	23,000
WMU	10,000	10,000	10,000	11,500	11,500	11,500
WMU Research Corp.	0	0	0	0	0	0
Beckley College	3,333	3,333	3,333	3,833	3,833	3,833
Software Valley Corp.	3,000	3,000	3,000	3,000	3,000	3,000
Total Direct Costs:	137,730	137,730	137,730	157,940	157,940	157,940
Fee	20,659	20,659	20,659	23,691	23,691	23,691
Total Expenses:	158,390	158,390	158,390	181,630	181,630	181,630
Revenues						
NASA Contract	158,140	155,640	154,140	176,230	173,580	173,630
Software Services	0	750	1,500	2,000	2,000	2,500
Electronic Communications	0	1,500	2,000	2,500	5,000	4,000
Educational Services	0	0	0	150	300	500
Printing/Duplication	250	500	750	750	750	1,000
Consultant Services	0	0	0	0	0	0
Seminars/Workshops	0	0	0	0	0	0
Total Revenue:	158,390	158,390	158,390	181,630	181,630	181,630

AdanET Second Year Projections (cont'd)

Major Cost Elements	April '89	May '89	June '89	July '89	Aug. '89	Sept. '89	Cumulative
Personal Services	65,700	65,700	65,700	65,700	65,700	65,700	762,686
Current Expense	41,400	41,400	41,400	41,400	41,400	41,400	480,600
Travel Subtotal	6,900	6,900	6,900	6,900	6,900	6,900	80,100
Outside Services	2,607	2,607	2,607	2,607	2,607	2,607	30,264
Research Equipment	23,000	23,000	23,000	23,000	23,000	23,000	267,000
WMU	11,500	11,500	11,500	11,500	11,500	11,500	133,500
WMU Research Corp.	0	0	0	0	0	0	0
Beckley College	3,833	3,833	3,833	3,833	3,833	3,833	44,496
Software Valley Corp.	3,000	3,000	3,000	3,000	3,000	3,000	36,000
Total Direct Costs:	157,940	157,940	157,940	157,940	157,940	157,940	1,834,646
Fee	23,691	23,691	23,691	23,691	23,691	23,691	275,197
Total Expenses:	181,630	181,630	181,630	181,630	181,630	181,630	2,109,842
Revenues							
NASA Contract	168,230	166,430	158,130	161,630	159,630	151,130	1,954,542
Software Services	5,000	5,500	6,500	7,000	8,000	8,500	49,250
Electronic Communications	6,500	7,000	7,500	8,000	8,500	10,000	64,500
Educational Services	900	1,200	1,500	1,500	1,500	1,500	9,050
Printing/Duplication	1,000	1,500	2,000	2,500	3,000	4,500	18,500
Consultant Services	0	0	1,000	1,000	1,000	1,000	4,000
Seminars/Workshops	0	0	5,000	0	0	5,000	10,000
Total Revenue:	181,630	181,630	181,630	181,630	181,630	181,630	2,109,842

AdanET Third Year Projections

Major Cost Elements	Oct. '89	Nov. '89	Dec. '89	Jan. '90	Feb. '90	March '90
Personal Services	65,700	65,700	65,700	75,555	75,555	75,555
Current Expense	41,400	41,400	41,400	47,610	47,610	47,610
Travel Subtotal	6,900	6,900	6,900	7,935	7,935	7,935
Outside Services	2,607	2,607	2,607	2,607	2,607	2,607
Research Equipment	23,000	23,000	23,000	26,450	26,450	26,450
WVU	11,500	11,500	11,500	11,500	11,500	11,500
WVU Research Corp.	0	0	0	0	0	0
Beckley College	3,833	3,833	3,833	4,000	4,000	4,000
Software Valley Corp.	3,000	3,000	3,000	3,000	3,000	3,000
Total Direct Costs:	157,940	157,940	157,940	178,657	178,657	178,657
Fee	23,691	23,691	23,691	26,799	26,799	26,799
Total:	181,630	181,630	181,630	205,456	205,456	205,456
Revenues						
NSA Contract	150,630	145,130	135,130	156,956	153,956	143,956
Software Services	10,000	12,000	15,000	15,000	15,000	16,000
Electronic Communications	12,000	14,000	15,000	18,000	20,000	22,000
Educational Services	2,000	2,500	3,000	5,000	5,000	5,000
Printing/Duplication	5,000	5,500	6,000	6,000	7,000	8,000
Consultant Services	1,000	1,500	1,500	2,500	2,500	2,500
Seminars/Workshops	1,000	1,000	6,000	2,000	2,000	8,000
Total Revenue:	181,630	181,630	181,630	205,456	205,456	205,456

AdanET Third Year Projections (cont'd)

Major Cost Elements	Apr. '90	May '89	June '90	July '90	Aug. '90	Sept. '90	Cumulative
Personal Services	75,555	75,555	75,555	75,555	75,555	75,555	877,094
Current Expense	47,610	47,610	47,610	47,610	47,610	47,610	552,690
Travel Subtotal	7,935	7,935	7,935	7,935	7,935	7,935	92,115
Outside Services	2,607	2,607	2,607	2,607	2,607	2,607	31,285
Research Equipment	26,450	26,450	26,450	26,450	26,450	26,450	307,050
WMU	11,500	11,500	11,500	11,500	11,500	11,500	138,000
WMU Research Corp.	0	0	0	0	0	0	0
Beckley College	4,000	4,000	4,000	4,000	4,000	4,000	47,499
Software Valley Cor	3,000	3,000	3,000	3,000	3,000	3,000	36,000
Total Direct Costs:	178,657	178,657	178,657	178,657	178,657	178,657	2,081,732
Fee	26,799	26,799	26,799	26,799	26,799	26,799	312,260
Total:	205,456	205,456	205,456	205,456	205,456	205,456	2,393,992
Revenues							
NASA Contract	145,456	141,456	129,956	131,456	117,956	118,456	1,670,492
Software Services	17,000	18,000	20,000	22,000	24,000	25,000	209,000
Electronic Communications	24,000	25,000	27,000	29,000	30,000	32,000	268,000
Educational Services	5,500	6,000	6,500	7,000	7,500	8,000	63,000
Printing/Duplication	8,000	8,500	9,000	10,000	11,000	12,000	96,000
Consultant Services	2,500	4,500	5,000	6,000	7,000	8,000	44,500
Seminars/Workshops	3,000	2,000	8,000	0	8,000	2,000	43,000
Total Revenue:	205,456	205,456	205,456	205,456	205,456	205,456	2,393,992

AdanET Fourth Year Projections
(Quarterly Distribution)

Major Cost Elements	1st QTR.	2nd QTR.	3rd QTR.	4th QTR.	Total
Personal Services	225,000	225,000	225,000	225,000	900,000
Current Expense	150,000	150,000	150,000	150,000	600,000
Travel Subtotal	20,000	20,000	20,000	20,000	80,000
Outside Services	12,500	12,500	12,500	12,500	50,000
Research Equipment	81,000	81,000	81,000	81,000	324,000
WMU	37,500	37,500	37,500	37,500	150,000
	0	0	0	0	0
WMU Research Corp.	12,000	12,000	12,000	12,000	48,000
Beckley College	9,000	9,000	9,000	9,000	36,000
Software Valley Corp.					
Total Direct Costs:	547,000	547,000	547,000	547,000	2,188,000
Fee:	82,050	82,050	82,050	82,050	328,200
Total Expenses:	629,050	629,050	629,050	629,050	2,516,200
Revenues					
NASA Contract	187,500	187,500	187,500	187,500	750,000
Software Services	175,000	175,000	175,000	175,000	700,000
Electronic Communications	150,000	150,000	150,000	150,000	600,000
Educational Services	22,500	22,500	22,500	22,500	90,000
Printing/Duplication	25,000	25,000	25,000	25,000	100,000
Consultant Services	75,000	75,000	75,000	75,000	300,000
Seminars/Workshops	35,000	35,000	35,000	35,000	140,000
Total Revenues:	670,000	670,000	670,000	670,000	2,680,000
Balance:	40,950	40,950	40,950	40,950	163,800

**AdanET Fifth Year Projections
(Quarterly Distribution)**

Major Cost Elements	1st QTR.	2nd QTR.	3rd QTR.	4th QTR.	Total
Personal Services	243,750	243,750	243,750	243,750	975,000
Current Expense	212,500	212,500	212,500	212,500	850,000
Travel Subtotal	22,500	22,500	22,500	22,500	90,000
Outside Services	12,500	12,500	12,500	12,500	50,000
Research Equipment	187,500	187,500	187,500	187,500	750,000
WU	43,750	43,750	43,750	43,750	175,000
WU	0	0	0	0	0
WU Research Corp.	12,000	12,000	12,000	12,000	48,000
Beckley College	9,000	9,000	9,000	9,000	36,000
Software Valley Corp.	9,000	9,000	9,000	9,000	36,000
Total Direct Costs:	743,500	743,500	743,500	743,500	2,974,000
Fee:	111,525	111,525	111,525	111,525	446,100
Total Expenses:	855,025	855,025	855,025	855,025	3,420,100
Revenues					
NASA Contract	87,500	87,500	87,500	87,500	350,000
Software Services	237,500	237,500	237,500	237,500	950,000
Electronic Communications	300,000	300,000	300,000	300,000	1,200,000
Educational Services	25,000	25,000	25,000	25,000	100,000
Printing/Duplication	37,500	37,500	37,500	37,500	150,000
Consultant Services	187,500	187,500	187,500	187,500	750,000
Seminars/Workshops	37,500	37,500	37,500	37,500	150,000
Total Revenues:	912,500	912,500	912,500	912,500	3,650,000
Balance:	57,475	57,475	57,475	57,475	229,900

AdanET Five Year Projection

Major Cost Elements	1988	1989	1990	1991	1992
Personal Services	433,163	762,686	877,094	900,000	975,000
Current Expense	387,117	480,600	552,690	600,000	850,000
Travel Subtotal	59,149	80,100	92,115	80,000	90,000
Outside Services	24,268	30,264	31,285	50,000	50,000
Research Equipment	93,500	267,000	307,050	324,000	750,000
WVU	109,336	133,500	138,000	150,000	175,000
WVU Research Corp.	0	0	0	0	0
Beckley College	39,996	44,496	47,499	48,000	48,000
Software Valley Corp.	39,000	36,000	36,000	36,000	36,000
Total Direct Costs:	1,185,529	1,834,646	2,081,732	2,188,000	2,974,000
Fee	114,368	275,197	312,260	328,200	446,100
Total Costs:	1,299,898	2,109,842	2,393,992	2,516,200	3,420,100
Revenues					
NASA Contract	1,298,298	1,954,542	1,670,492	750,000	350,000
Software Services	0	49,250	209,000	700,000	950,000
Electronic Communications	1600	64,500	268,000	600,000	1,200,000
Educational Services	0	9,050	63,000	90,000	100,000
Printing/Duplication	0	18,500	96,000	100,000	150,000
Consultant Services	0	4,000	44,500	300,000	750,000
Seminars/Workshops	0	10,000	43,000	140,000	150,000
Total Revenues:	1,299,898	2,109,842	2,393,992	2,680,000	3,650,000
Balance:	0	0	0	163,800	229,900

3.8 Appendix A: Initial Marketing Survey Results for the AdaEXPO-Boston, MA, December, 1987

This document represents the results of a survey of participants at the Ada Expo '87, held in Boston, MA during December of that year. Mountain-Net recognizes that two key elements exist regarding the participants and respondents:

1. The largest majority (45%) of survey respondents were from the Aerospace and Defense contractor community. This represents a bias which cannot be ignored.
2. Although this bias exists, the results of this survey are significant because the Aerospace and Defense contractor community represent the baseline constituency for the AdaNET service.

Each form receives it's own page and accompanying analysis in order to make the results readable and the analysis more understandable. Finally, conclusions are drawn from this survey which explain the view espoused in the business plan.

Respondent Profile

Affiliation	Count
Aerospace and Defense	44
Software Companies	12
Government	12
No Affiliation Listed/ Other	12
Educational Institutions	9
Hardware Manufacturers	9
TOTAL	98

Affiliation With Professional Organizations

Affiliation	Count
SIGAda	68
IEEE	36
None or No Response	17
AdaJUG	15
Other*	9

TOTAL 145

* "Other" = one response only. Represented were: SIGPLAN, AIAA NSIA, etc.

Survey Data

Raw Results

Questions Asked by Order

*** Note:** Responses to each question were; Very Useful, Useful, Not Useful. In some cases, no response was given. All Responses were ordered by % of responses without regard for no response.

Question	Response			Rank		
	Very Use	Use	Not Use	Very Use	Use	Not Use
Commercial Products and Services	24	41	13	8	2	4
Contracting Opportunities	29	19	26	6	10	3
Ada Faceted-Classifications for Reuse	40	25	9	4	9	6
Topical Search Categories for Reuse	45	25	10	2	9	5
Documentation and Information	32	40	6	5	3	7
User Communications	21	39	13	9	4	4
Ada-Specific Metrics	44	35	3	3	5	8
On-Line Tutorials	15	34	26	10	6	3
Computer Based Training	15	30	26	10	6	3
Telephone Help-line	15	30	29	10	8	2
Project Management Software	25	53	9	7	1	6
Software Engineering Methodology	54	33	3	1	7	8
Total Responses	359	404	178			

Based on Percentage of Response

Question	% Response
1. Software Engineering Methodology	91.83
2. Project Management Software	88.77
3. Ada Specific Metrics	83.67
4. Topical Search Categories for Reuse	81.60
5. Documentation and Information and Commercial Products and Services	79.59
6. Computer-Based Training	77.55
7. On-Line Tutorials	76.53
8. Contracting Opportunities and Ada Faceted Classification for Reuse and Telephone Help-Line	75.50
9. User Communications	74.48

Ranking of Importance

Topic	Rank
1. Software Engineering and Methodology	256
2. Ada Specific Metrics	228
3. Topical Search Categories for Reuse	200
4. Ada Faceted Classifications for Reuse	180
5. Documentation and Information	150
6. Project Management Software	94
7. Commercial Products and Services	61
8. User Communications	49
9. Contracting Opportunities	17
10. On-Line Tutorials	-33
11. Telephone Help-Line	-47
12. Computer Based Training	-67

* Note: Ranking Methodology. Very Useful=+10; Useful=+1; Not Useful=-

1.

- Highest possible score = 275
- Lowest Possible score = -239

Chapter 4

Technical Plan

4.1 Scope

This document is the Technical Plan for AdaNET Project Services implementation. Additionally, the document represents a deliverable item under Cooperative Agreement #NCC9-16. The intent of the Technical Plan is to describe how MountainNet, Inc. will establish a software engineering and Ada technology transfer network. Further, it takes into account that the University of Houston - Clear Lake (UHCL), Research Institute for Computing and Information Systems (RICIS) has an in-place network of computing facilities. Additionally, this plan accounts for other networks which may be instrumental in the formation of this network. The network is called: "AdaNET: The Advanced Software Engineering Network for Ada Applications" to inform potential users of the general-purpose nature of the network. AdaNET is a registered trademark of the commercial entity MountainNet, Inc., AdaNET's developer.

This document first discusses AdaNET, including it's current configuration. Next, the functional requirements are detailed, followed by a statement of the tasks and deliverables MountainNet expects to meet. Additionally, quality and standards assurance are specified as part of this plan. Finally, the plan details the additional resources required to successfully implement this important technology transfer mechanism, including an organizational structure and a milestone and deliverable schedule.

4.1.1 Goal

The goal of AdaNET is to act as a change agent by transferring existing and emerging software engineering and Ada technology from the federal government to the private sector.

Attainment of this goal is based upon accomplishment of three primary objectives:

1. Develop a service center offering a wide spectrum of software engineering and Ada technological information services.
2. Achieve long term commercial independence through cost recovery

measures.

3. Create a broad-based intergovernmental and private sector infrastructure to ensure continuing AdaNET services.

This plan concentrates on specifying implementation of the first of these objectives. Other documents generated during the first and second phases of this project will address remaining objectives.

4.1.2 AdaNET System Overview

AdaNET is divided into three main categories:

1. *AdaNET Information Services (AIS)*, which will incorporate user forums, bibliographic and full text information, educational materials, electronic communications, directories and publications, and information about other Ada repositories and libraries.
2. *Dynamic Software Inventory (DSI)*, which will be comprised of libraries of public domain Ada software components and their associated life cycle objects. Accompanying value-added services, such as the tracking and classification of these objects across and within the life cycle, will encourage and aid in the reuse of these objects.
3. *Professional support services* such as general and specialized consultant services, seminars and workshops.

These services will be provided on a wide spectrum of distribution media that include:

- CD-ROM
- Diskette
- Magnetic Tape
- On-line Access
- Printed Media

Figure 4.1 depicts the AdaNET Gateway/Clearinghouse Functional Overview

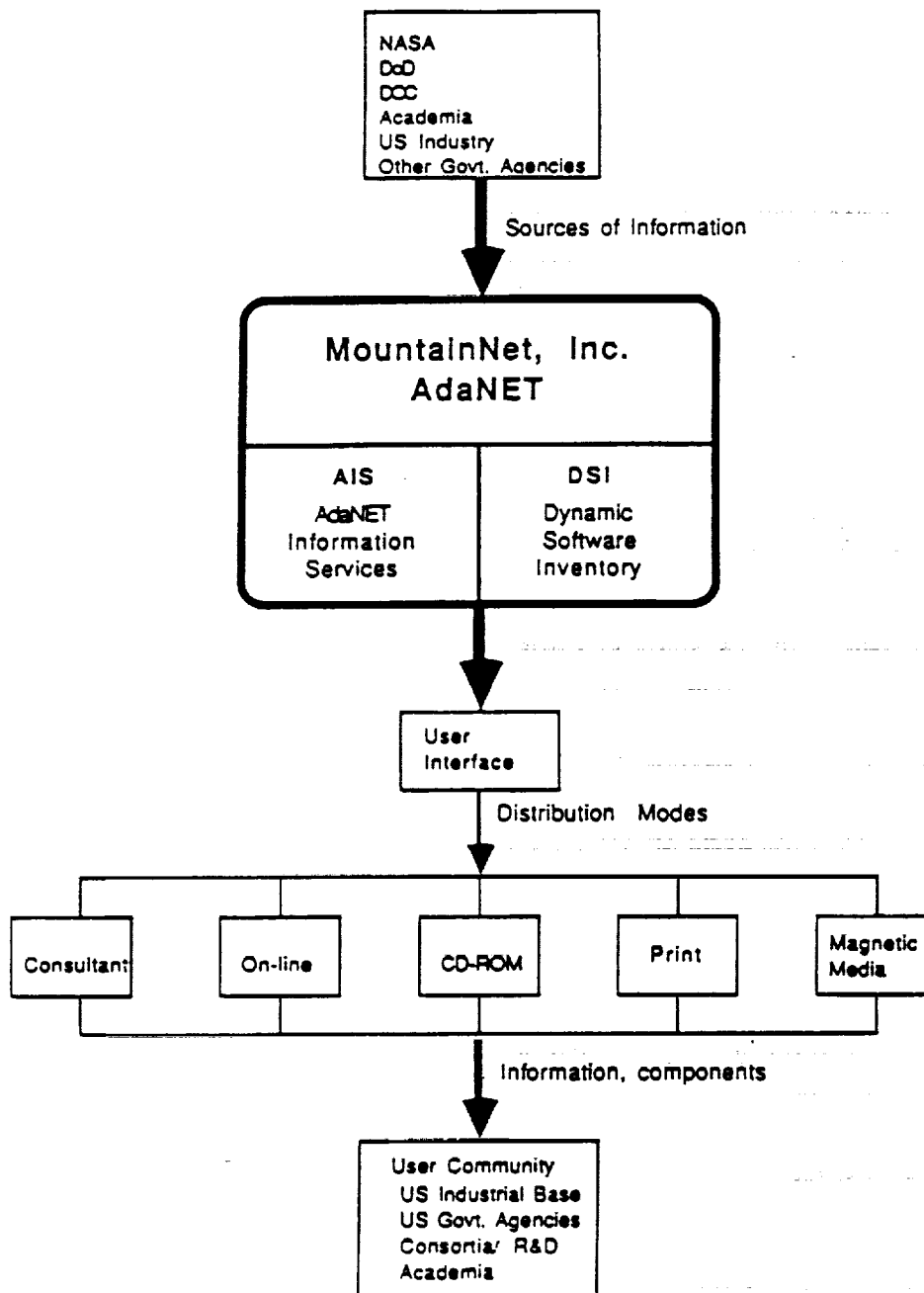


Figure 4.1: AdaNET Gateway/Clearinghouse Functional Overview

Participating Organizations Views

One of the earlier deliverables for this project was a report detailing the views of several key organizations involved in the AdaNET program. These organizations were interviewed and their comments incorporated into that document. The organizations are:

- National Aeronautics and Space Administration (NASA) Technology Utilization Division (TU)
 1. Computer Software Management and Information Center (COS-MIC)
 2. NASA Industrial Applications Center
 3. NASA Technical Applications Team
- University of Houston - Clear Lake, Research Institute for Computing and Information Systems
- Department of Defense Ada Joint Program Office (DoD AJPO)
- Department of Commerce, Office of Productivity, Technology and Innovation (DOC OPTI)
- Beckley College
- Software Valley Corporation (SVC)
- West Virginia University/WVU Research Corporation

To sum up the results of the meetings and information exchange, three federal government organizations funded the AdaNET project to:

"increase U.S. competitiveness through the transfer of software engineering technology and government developed Ada software, to benefit the manufacturing, industrial, educational and other private sector communities"

These three organizations are the NASA TU, DoD AJPO, and DOC OPTI.

Applicable documents

The following list of documents have been previously delivered under the subject contract. This list is included for reference, and individual documents will be referred to by name in the body of this report.

- Subcontract No. 002, UHCL to MountainNet
- AdaNET Electronic Mail Service, Draft Users Guide
- AdaNET Organizational Structure and Report of Project Activity

- AdaNET Organizational Documents
- AdaNET Business Plan

4.1.3 Schedule Constraints

This section provides an overview of potential obstacles to the proposed schedule (See Section 4.6). This does not mean the schedule will change, only that MountainNet is aware of these possible disruptions and is taking management action to ensure schedule adherence.

Potential constraints that would serve to alter and extend the schedule of deliverables include:

- Interruptions in funding;
- Expansion or addition of elements in the statement of work (SOW);
- Delays in coordination and direction from government/private sector participants, where such interaction is necessary for deliverable development;
- Deferred developmental schedules in other federally funded projects whose deliverables support technical development of AdaNET services.

4.2 AdaNET Functional Requirements

This section describes the functional requirements for the AdaNET system. These derived requirements are based on input from the principal organizations supporting the project. (Section 4.1.2 delineated those organizations.) Requirements are discussed for:

- Networking and Communications;
- Hardware;
- Software;
- Data and Information Sources;
- Operational considerations;
- The Dynamic Software Inventory (DSI);
- The Reuse Database;
- The AdaNET Information Services (AIS).

4.2.1 Networking and Communications

This subsection addresses the need AdaNET has to establish and operate a network system in order to communicate with a potentially large popula-

tion. It considers that in some instances, AdaNET will act as a stand-alone network with it's own dial-in capability. In other circumstances, AdaNET will be required to be a part of a larger, heterogeneous network. The latter will be discussed in subsection 4.2.1 and in section 4.3.7, "Growth Plan for Additional Services".

Existing Elements

MountainNet's current telecommunications configuration provides on-line computer access to host systems available within the MountainNet telecommunications network, as well as host systems located in state supported telecommunications networks. Access is provided through remote user node sites connected directly into the MountainNet network with dedicated data circuits, and through local dial-in telephone lines located throughout West Virginia.

Access to MountainNet host systems, such as those forming the AdaNET host configuration, is currently available through MountainNet's own dial-in lines, through all state educational network (West Virginia Network for Educational Telecomputing (WVNET)) dial-in lines, and by cooperative agreement, through a Telenet Sprint connection currently providing direct access to the WVNET DCA network server. Current volume capabilities for the Telenet link are 15 simultaneous users; this number will be increased as usage justifies further expansion.

Planned Expansion

Systems Interconnectivity: Plans are being finalized for internal network interconnection of all host systems used to develop AdaNET. A configuration which allows a high level of interconnectivity includes use of a commercial off-the-shelf (COTS) star network controller. This controller supports Ethernet and TCP/IP (Transmission Control Protocol/Internet Protocol) communications. Additionally, layered communications software, supporting electronic mail transfer between many vendors hardware products and operating systems and the Internet, is also included. Specialized software is under development to support electronic mail transfer between Digital Equipment Corporation (DEC) Virtual Memory System (VMS) and Data General (DG) Advanced Operating System/Virtual System (AOS/VS) host systems currently in the configuration. For full support of direct intersystem disk access and data transfer, an additional COTS package would be

layered on top of the star controller, providing complete DEC/DG compatibility. This controller may be connected directly into the MountainNet network, to provide network level single point access to AdaNET users for all on-line services.

Direct Telenet Connection: This service provides direct connection to MountainNet's network at the Telenet prompt level for AdaNET users. A final step is to route users directly to AdaNET specific front-end network controllers. The user is then prompted for specific AdaNET systems.

MountainNet Network Expansion: For those areas where a substantial base of AdaNET users exist, MountainNet will establish dedicated lines to support them with a higher level of telecommunications service than that provided by Telenet. Direct connections are currently being discussed for:

Washington, D.C.: For Government Access

Clear Lake, TX : For UHCL and Johnson Space Center (JSC)

Other potential areas of high level usage during subsequent phases of implementation include:

Huntsville, AL : For Marshall Space Flight Center (SFC)

Boston, MA : To provide computer vendor coverage

Pittsburgh, PA : For the Software Engineering Institute (SEI)

NASA Networks Interconnection: AdaNET is comingling the diverse Ada community which includes NASA, DoD, academia and the private sector. However, the majority of AdaNET users already communicate on one or more electronic mail systems. The users of AdaNET include key individuals from diverse (and unconnected) telecommunications systems. Introduction of another autonomous mail system presents an obstacle to the community already using these other networks. Therefore, in addition to building its own internal base of AdaNET user accounts, MountainNet is studying how inter-network

connections can be established to provide electronic mail transfer as a minimum level of service.

The volume of development activities using Ada technology at various field centers is radically increasing. The inter-network connection would facilitate communications with these field centers and heighten the availability of Ada technology developments to AdaNET users.

MountainNet is currently studying the NASA network structures in place at various field centers and the network architectures which currently link those centers together. MountainNet will determine the feasibility of this network connection.

The NASA Scientific Network, which is also supported in part by the National Science Foundation (NSF), is an example of a gateway which will be pursued because it is intended to provide a mechanism for public/private sector technology exchange. This network is TCP/IP based, and so connection will be supported by the equipment currently being integrated into the configuration. Administrative and policy issues regarding approval for connection is also being pursued.

Internet/DDN Connection: A connection to the DoD Defense Data Network (DDN) is essential to maintain and enhance the base of support being provided by various DoD organizations. The majority of the national Ada community is affiliated with the DoD, either as military, government, or contractor/subcontractor personnel. With ongoing and proposed expansions in DoD based Ada programs, this linkage will facilitate a higher level of activity and cooperation between AdaNET and the Ada community. SIGAda, whose executive council is trying out the AdaNET as their major communications source, has indicated that such a connection is essential for continued use, since a large percentage of their membership currently use the Internet. Discussions with the U.S. Army Office of the Directorate for Information Systems for Command, Control, Communications and Computers (ODISC4) led to the recent signing of a Memorandum of Understanding (MOU) between NASA and the Army to support AdaNET development. A key objective of this MOU is to expand the base of support for AdaNET's connection to the Internet with other Army activities such as the Information Systems Engineering Command (ISEC). MountainNet is currently evaluating the telecommunications and software requirements necessary for this connection.

USENET Communications: USENET information transfer occurs through a WVU DEC/VAX system. As the AdaNET Information Services (AIS) system is developed, MountainNet will task one individual to conduct regular checks of the USENET information. Information which is relevant to the AdaNET user community will be transferred to the AIS. An expansion of the AdaNET level of service includes direct connection of USENET into the MountainNet network. This will provide regular access to this resource.

SEAD Connection: By establishing a data line with local dial-in in the Houston area, MountainNet will be able to provide a direct link for interconnection of the SEAD (Software Engineering and Ada Database) system operated by UHCL. This connection will make SEAD available to any AdaNET user at the network prompt level as another available host node and service. Building this distributed network of host services enhances the direction of growth and increases the value of AdaNET as a single point of access to a multitude of diverse services.

OSI Integration: As the Open Systems Interconnect (OSI) protocol is implemented at all levels, we will study the feasibility of integration of that protocol into AdaNET. An applications gateway between the mail layer and the file transfer layer of the TCP/IP and OSI protocols is being developed for the DoD. DoD plans to require that all future procurements be based on OSI protocols. Integration of an OSI implementation for AdaNET would most likely occur sometime after such requirements became mandatory.

Figure 4.2 depicts AdaNET Network Connectivity.

4.2.2 Hardware

This subsection describes the current hardware configuration for AdaNET. It describes each element and details future hardware requirements to ensure continuing viability.

Present Configuration

MountainNet utilizes a multi-vendor systems environment for services implementation. The following resources for early prototyping and implementation are being applied:

- (2) Digital Equipment Corporation VAX 11/7XX (VMS)
- (1) Digital Equipment Corporation VAX 11/750 (UNIX)
- (1) Data General MV8000 (AOS/VS)
- Various micro-computers (Apple & IBM PC compatibles)

The systems are being used in the following capacities:

DEC VAX 11/780 (VMS): This resource is MPL Corporation's VAX time-share service. The system is configured on-line into the MountainNet network. MountainNet is using this machine to provide all computing services for internal project administration. It is initially being used to provide AdaNET Electronic Mail and Document Transfer services. Prototyping of low level repository access, library information services, and information system screen formats is being performed on this VAX. However, the addition of AdaNET services on this resource intensive service will tax the system beyond manageable limits. Although AdaNET's internal administrative computing will continue to be performed on this system, additional resource requirements are expected.

DEC VAX 11/750 (VMS): A DEC VAX 11/750 is being merged into the AdaNET configuration for dedicated AdaNET use. This system will initially provide a migration point from the VAX currently in use, and will offer services for prototyping and development. AdaNET plans to use DEC VAX/VMS systems as the main user interface. Among the reasons for this decision:

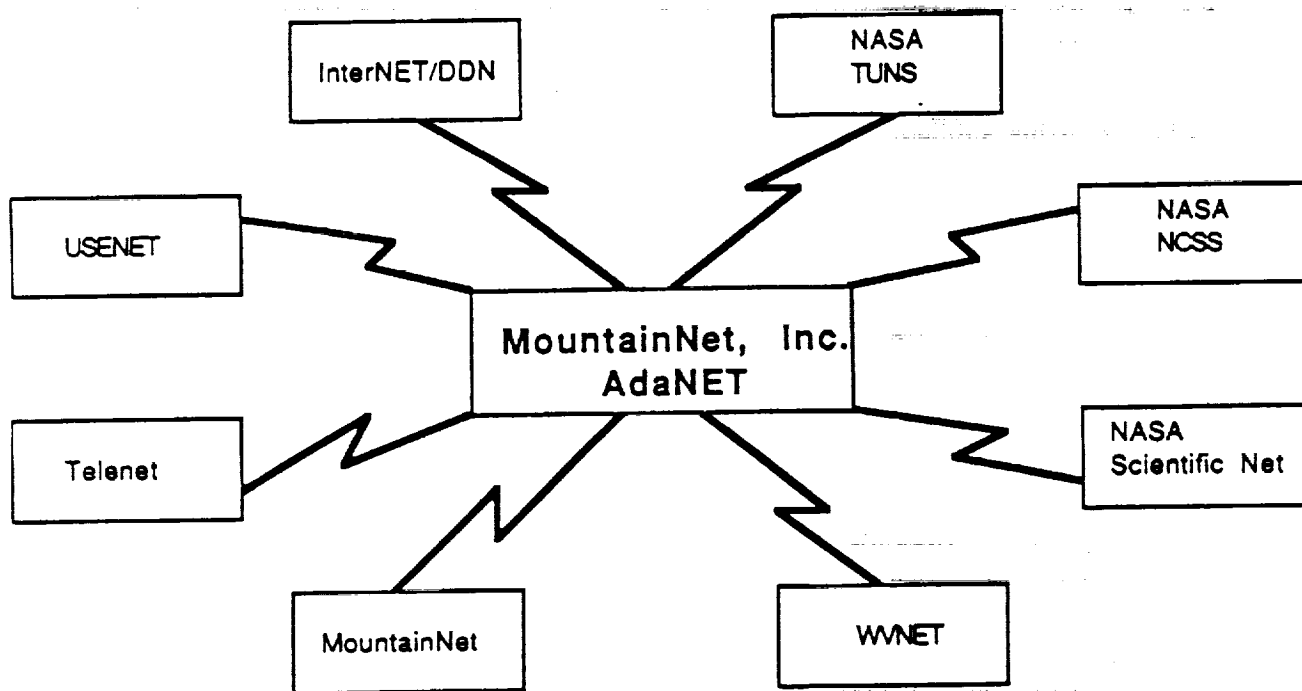


Figure 4.2: AdaNET Network Connectivity

- VMS library routines and terminal identification tables support multiple terminal translations for interactive user communications.
- VMS supports high level interconnectivity with other vendor machines.
- Most packages support microcomputer (e.g., Apple MacIntosh, etc.) to minicomputer high end communications such as mouse driven user entry to the remote machine are supported in the VMS environment.

DEC VAX 11/750 (UNIX): Use of a DEC VAX 11/750 UNIX is being provided as part of the WVU Statistics and Computer Science in-kind contribution to AdaNET development. This system will be used to develop initial software testing and analysis for the Dynamic Software Inventory (DSI) components. The system will be available through AdaNET.

Data General MV8000 (AOS/VS): MountainNet's system, equipped with multiple disk controllers, high volume storage and DG's Ada Development Environment (ADE) is being used for storage, compilation and evaluation of Ada Software Repository (ASR) components. Through planned network expansion, this system will serve as the main resource for implementation of the object retrieval system of the DSI. The systems interconnection allows development of applications to support data transfer between the DG storage system and the DEC VAX/VMS system, with complete transparency to DSI users. Low level access to components is being established so that users can obtain copies of repository software which have not been entered into the DSI.

Future Expansion

Service expansion will require continuing system enhancement and development. MountainNet's long term systems strategy is to study the possibility of utilization of a combination of the following hardware resources:

DEC VAX 8500 (VMS): As the first tier of services are developed and made commercially available, volume usage is expected to exceed the capacity of the VAX 11/750. It will either continue to serve as an internal development machine, or be networked with other AdaNET host systems and provide continuing services support. The main user interface system(s) used to access the Dynamic Software Inventory

(DSI) and AdaNET Information Services (AIS) will require the level of resources provided by a machine of this class. After analysis of the mix of users of various services, an alternate strategy may be to establish multiple host systems providing one or more related services and to segregate those services which require competing types of resources.

Harris HCX9 (UNIX): Network access is being expanded for this system in the WVU configuration. Resources will be utilized on this system to support AdaNET as part of WVU's in-kind support. This machine may also be utilized for development of automated code testing and evaluation processes.

Terradata DBC/1012: MountainNet expects growing storage requirements within the next two years of development. We are looking at various mass storage and database machine technologies to support the DSI software library. Currently, both the relational and object oriented database models are being researched. If the relational model is chosen, the Terradata machine will be considered.

Terradata represents one of only two major producers of database machines (the other being Britton-Lee). Use of this type of machine architecture is preferable to use of other mass storage technologies, such as Optical Disk/WORM (Write Once/Read Many) Storage and Retrieval systems, which are not designed for dynamic use. Terradata's Shared Information Architecture system provides connectivity to a variety of processing environments and information tools. The DBC/1012 can be connected to multiple host mainframes at the same time.

Figure 4.3 depicts the proposed AdaNET configuration.

4.2.3 Software

This subsection describes software acquisition and development activities for AdaNET. It includes software which may be available in the public domain.

Off-the Shelf

The following COTS software is either required or being evaluated to support services delivery:

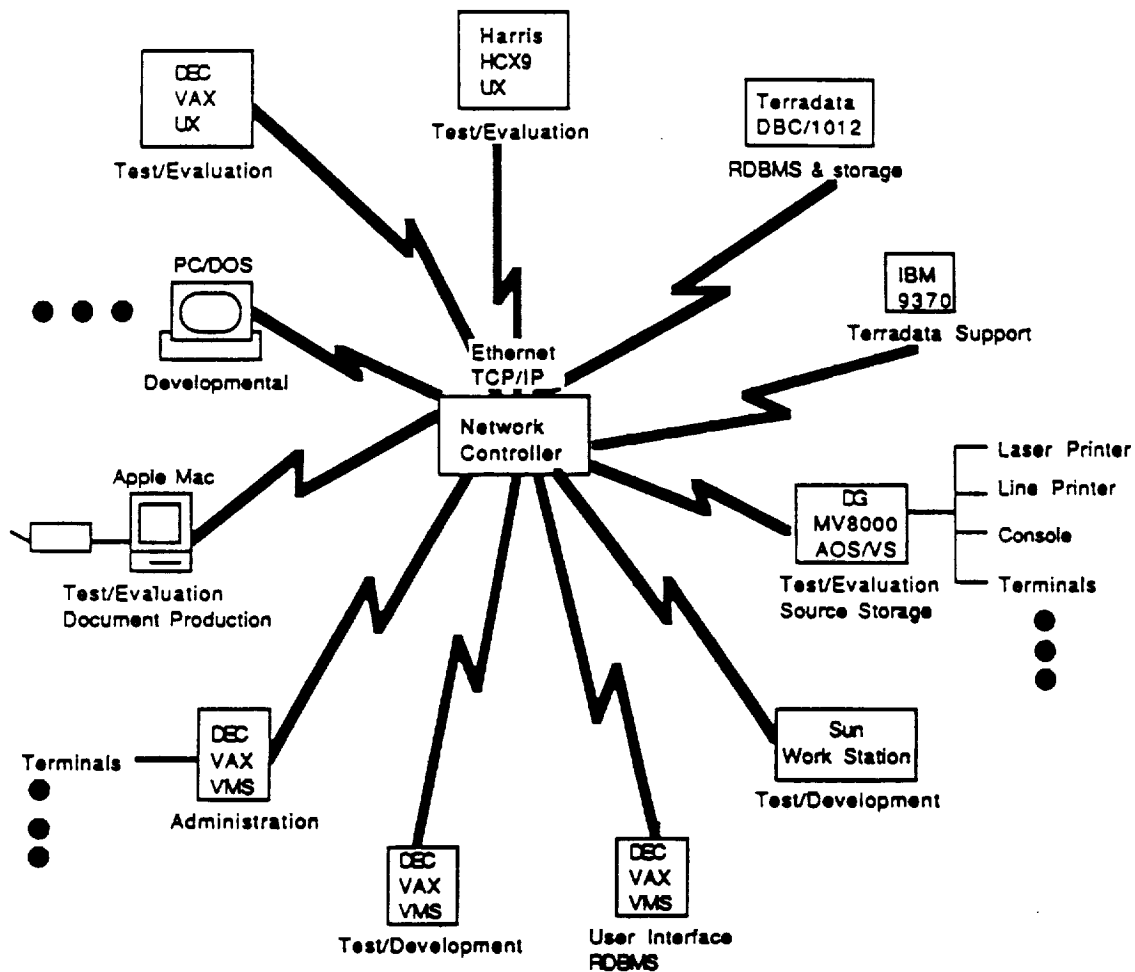


Figure 4.3: AdaNET Proposed Systems Configuration

Digital Equipment Corporation DECnet network software: This software will be supported on all MountainNet VAX systems in its configuration, which will provide DECnet-level connectivity between VAX and Data General system resources, allowing disk to disk information access.

Ki Research DEKnet network software: This software, layered on top of an Ethernet carrier, will integrate with DEC DECnet software, providing systems interconnectivity between AdaNET host DEC and DG systems. It will be supported on MountainNet's Data General MV8000 (AOS/VS) system.

Relational Database Management System: Commercially available relational database management systems (RDBMS) are being evaluated for supporting the design and implementation of the reuse database, which provides the object inquiry facility of the DSI. Should a database machine become available, the design of the database would be easily transferrable to that machine. Should the relational model be chosen, only RDBMS' that support Structured Query Language (SQL) will be considered. As part of the evaluation, RDBMS' implemented in Ada will be examined, such as CRI's Relate 3000.

Ada/SQL Binding: The development of satisfactory Ada/SQL bindings has become a major topic in the Ada marketplace. Should they become available, AdaNET will utilize Ada/SQL bindings that are being developed as part of the Software Technologies for Adaptable, Reliable Systems (STARS) tools development programs.

Configuration/Library Management: The AdaNET staff will utilize, wherever possible, tools developed in other government supported programs for configuration and library management. Programs sponsored by STARS, such as the Army Institute for Research in Management Information, Communications, and Computer Science program (AIRMICS), may yield valuable toolsets.

Text Retrieval System: To support the provision of specific areas of the AdaNET Information Services (AIS), evaluation of various text retrieval

database systems are being conducted. One package that is being closely evaluated is the INMAGIC package, developed by INMAGIC, INC.

DCDS/Ada: Members of the AdaNET staff are currently beginning evaluation of the DCDS/Ada (Distributed Computing Design System) distributed Ada development environment, whose development is being supported by the Army STARS initiative.

SGML Implementation: A commercially available copy of Standard Generalized Markup Language (SGML) will be obtained.

Development Tools and Environments: AdaNET is also evaluating other support tools and environments that may support internal software development activities. Such products will include EVB Software Engineering's Ada MacHost product, Iconix Software Engineering's Power-tools system, and the Distributed Ada Programming Support Environment (DAPSE) project software under development by the Army STARS initiative.

Developmental Activities

Software to be developed for AdaNET includes:

- User interfaces
- Automated Software Testing Tools
- Software Retrieval System Applications Software
- Configuration/Library Management Tools

4.2.4 Data and Information Sources

This subsection details the sources of life cycle products which will become part of the Dynamic Software Inventory (DSI), specified in subsection 4.2.6. It describes the known repositories to which MountainNet has access and permission to include.

Life cycle products are being solicited from a variety of sources that include public domain libraries, software projects which are obtained directly from developers as they evolve, and proprietary sources.

Current sources of non-classified components include:

NASA sources:

- Space station software (Software Support Environment (SSE), etc.)
- Products of Software Reuse Environment
- COSMIC
- Other major NASA development activities

DoD - STARS

- Foundations
- Competing Primes
- Shadows
- Future repositories established by STARS Army
- SIMTEL-20 Ada Software Repository (ex., Worldwide Military Command and Control System (WWMCCS))
- Reusable Ada Packages for Information Systems Development (RAPID)
- Specific software development programs (ex., MAFIS) Air Force
- Naval Ocean Systems Command (NOSC) library (primarily included in the ASR)
- Naval Research Laboratory (NRL) STARS Foundations software
- Specific software development programs (ex., AWHMS)

DOC

- National Bureau of Standards (NBS): automation primitives and tools taxonomies, CIM/FCIM (Computerized Integrated Manufacturing/Flexible Computerized Integrated Manufacturing) Ada systems development

Department of Transportation

- Federal Aviation Administration (FAA): All new systems will be developed using Ada

Private sector sources with whom MountainNet is establishing operational agreements.

AdaNET is continually working to increase new sources of Ada components and repositories.

Figure 4.4 depicts the initial sources of life cycle products.

4.2.5 Operational Considerations

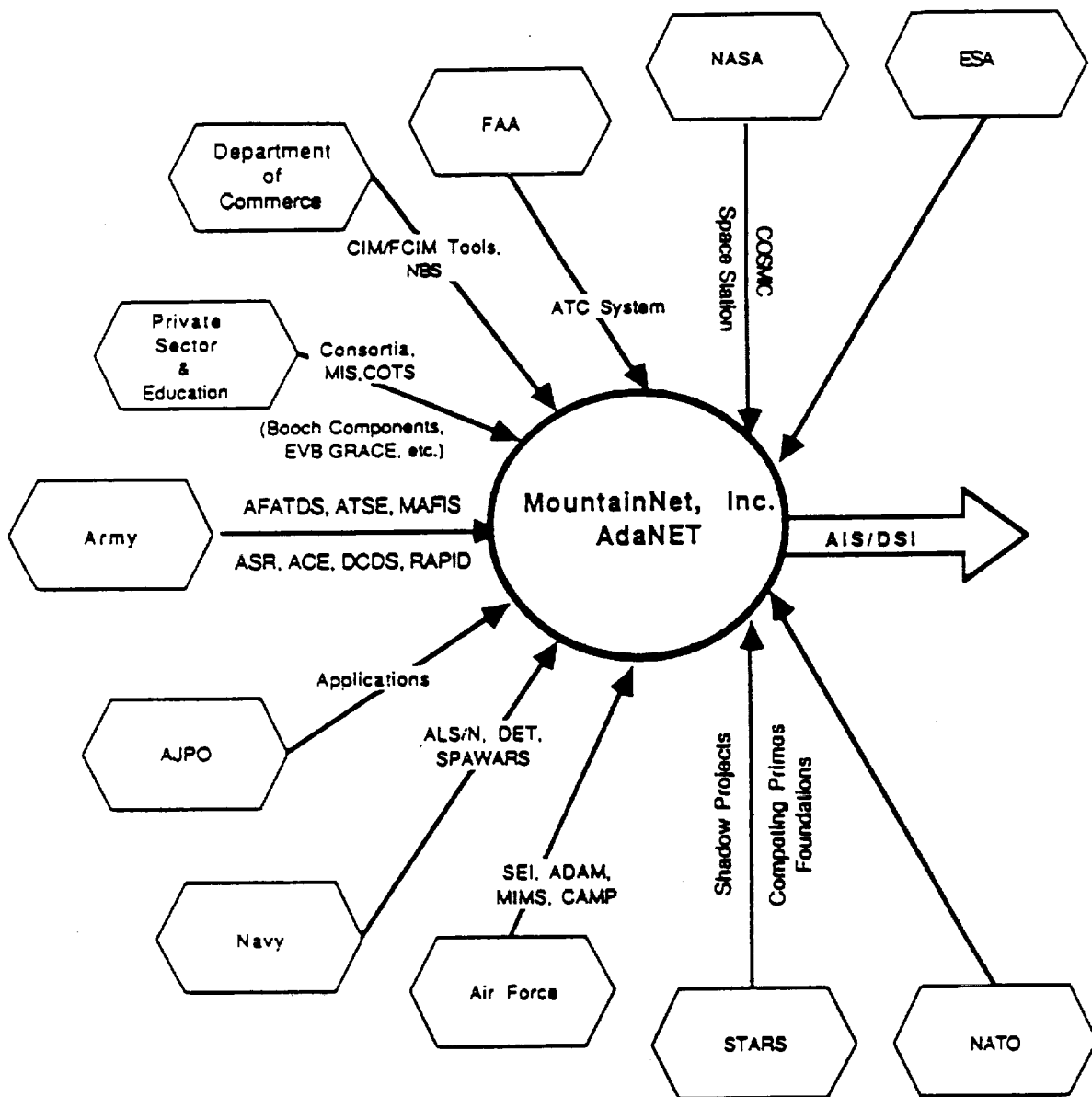


Figure 4.4: Sources of Software Engineering and Ada Technology

In addition to the purely technical considerations for requirements, the AdaNET project must also address the boundaries of day-to-day operations. This is due to the outreach nature of AdaNET. In order to implement the service, items must be addressed which are not necessarily germane to the successful operation of a networked database systems.

This section addresses eight important operational considerations and their impact on AdaNET. These are:

- the expected volume of data and usage;
- distribution of information beyond on-line computing;
- a user-assistance function;
- user billing;
- telephone support for user questions;
- user documentation;
- on-line access methods;
- microcomputer access.

Expected Volume

MountainNet expects a user base of 250 accounts during the first full year of operation. Based on statistical samples of current accounts/users, we can expect approximately 50 simultaneous users on AdaNET.

AdaNET will track usage profiles over time in order to determine the optimum mix of resources for future expansion.

Distribution Media

Users of AdaNET will not only be able to access information on-line, they will also be able to receive information through other media, in a variety of formats. Media currently planned are:

- CD-ROM
- Diskette
- Magnetic Tape
- Printed matter

Additional media will be made available as the desire for them is expressed. The information will be made available on CD-ROM/Magnetic tape to interested parties, thus allowing users to reduce on-line access and connect time charges. As preferences for formats shift over time, MountainNet will modify its support accordingly. In this way, the value-added nature of AdaNET will be free to expand the boundaries of service in response to user needs.

User Assistance

Due to the service-oriented nature of AdaNET, we can expect a high level of client interaction. This means that MountainNet plans to establish administrative and operational procedures to ensure that each AdaNET client receives the service necessary to promote usage, goodwill and expanded knowledge of AdaNET environment.

From a revenue perspective, user support must be included as a key element in billing algorithms. Most likely, AdaNET will spread the cost of user support among all clients, as a percentage of system access usage. In this way, we can be sure that full service will be provided to each client and that no client will suffer from a lack of human resources.

Service Revenue Structures

The AdaNET project will gather usage information whenever clients log onto the system. This data will account for:

- Log-on time;
- Log-off time;
- Number of disk accesses;
- Amount of data down-loaded to users' systems;
- Different types of information retrieved.

In all cases, MountainNET understands that the difference between data and information will make a difference in billing for a given session. For example, if a client retrieves data which points him toward another resource for information, he will be billed less than if the retrieval nets information which is unavailable elsewhere. This logic follows an automated path for traditional information and data services, i.e.; the Auerbach Report. Although not automated, a substantial fee is charged. The difference with AdaNET is that it will be billed only for the information retrieved, not all the information on the database.

Another aspect of billing which AdaNET will take into account is the difference between government, commercial and academic sectors of our economy. Since the government's primary goal is cost avoidance, they will be billed at a reduced rate. Basically, academic institutions and government sponsored R&D facilities will be billed at the same rate as the government. The major rationale for the difference is that industry organizations will use AdaNET information for the purpose of increasing their profits. This is expected and welcome. However, because of that reason, "the market"

(industrial organizations) will bear a higher cost for data.

Wherever possible, revenue structures will be established that will allow simple and affordable low-level access charges using combinations of subscription, purchase, and incremental charges. For a more complete discussion of revenue structures, please refer to the AdaNET Revenue Support Structure report prepared as another deliverable item to UHCL.

Telephone Support

On-line telephone support will be provided as needed to AdaNET users, giving help in the use of system services, with more detailed help available for use of specific services (such as the DSI and other library services). This support is available now, and is being provided for the services currently available, which are electronic mail and document transfer. As new services are made available, such as the on-line AdaNET Bibliographic System (ABS), support requirements are expected to increase.

Individuals responsible for implementation of specific services are providing this support. For example, questions about use of the electronic mail services are fielded by the AdaNET Communications Coordinator; telecommunications access or difficulties are handled by individuals in Network Support; ABS inquiries are taken by the AdaNET librarian, and questions regarding the use of the DSI are fielded by a member of that team.

Detailed information about telephone support will be included in the AdaNET Operational Policies and Guidelines handbook which is currently being assembled.

User Documentation

User documentation is one of the most important requirements for AdaNET. Primarily, it is the means by which each user will be able to access and utilize the AdaNET resource.

On-Line Access

The AdaNET system user interface being developed satisfies several major requirements [Shneiderman]:

- proper functionality
- reliability
- availability
- security

- integrity
- schedules
- budgets

The development team is determining the tasks and subtasks the interface needs to perform. Functionality of this interface includes those tasks needed to tie users to applications and/or databases. Compatibility of the interface with different vendor machines that may be used to access AdaNET services will be a major consideration during interface design.

Human factors determined through MountainNet's experience in analysis of behavioral patterns and responses of the many diverse interactive user groups in its user base, as well as current research, form the foundation for design of the AdaNET interface. These factors include:

- time to learn
- speed of performance
- rate of errors by users
- subjective satisfaction
- retention over time

The AdaNET interface will be designed for both ease of learning in a short period of time and full functionality for the experienced user. Rules governing this interface design are:

- Consistency: Response conventions will be the same throughout the system.
- Shortcuts: Frequent users will be able to use shortcuts to more rapidly traverse the system.
- Offer informative feedback: Respond to all the user actions.
- Design dialogs to yield closure: Each group of actions has a beginning, middle, and an end. Users receive proper feedback at the close of the group of actions.
- Simple error handling: The system will be designed to avoid serious errors by users. If errors are made, easy error handling mechanisms will be provided.
- Easy reversal of actions: Actions will be reversible wherever possible.
- Internal locus of control: Give users a feeling of control over the system, making them initiators of actions rather than responders.
- Reduce short-term memory load: Users should not have to remember more than seven plus/minus two items at any given time. Help will

always be available to assist users with code mnemonics and sequences of actions.

AdaNET's standard interface environment will use elements of most of the major current interaction styles at various levels of the system. Current interaction styles include:

- Menu selection: Allow users to choose among several options.
- Form fill in: Users fill in blanks and the cursor is automatically moved using predefined keys.
- Natural language: Users construct queries in their natural language, which are then interpreted by the system.
- Direct manipulation: Users are allowed to manipulate objects on the screen directly using a pointing device.

Microcomputer Access

In addition to providing on-line access to repository components, the AdaNET development team plans to implement a stand-alone microcomputer version of the Dynamic Software Inventory (DSI), utilizing graphic, windowing, and mouse interface capabilities.

This interface will initially be developed for the Apple MacIntosh, using the Toolbox provided by Apple. The Toolbox supports design of windows, dialog boxes, drop down menus and some direct manipulation techniques. The Telegen2 system, developed by Telesoft, is being considered as a way to develop this interface. The Ada Compiler and related tools developed by Meridian Software Systems, Inc. and Alsys, Inc. are also being investigated. Telesoft and Meridian are developing an interface to the Macintosh Toolbox, and have developed a compiler for the Macintosh II system.

4.2.6 Dynamic Software Inventory (DSI)

This subsection defines the requirements for a Dynamic Software Inventory (DSI), a branch of the AdaNET Information Services (AIS). It discusses the background and rationale for the DSI.

Background

The DSI will provide access to both life cycle objects and value-added services relevant to those objects. Its design will allow users to view objects

across and within the phases of the life cycle. Furthermore, mechanisms will be developed within the DSI to encourage users to submit their own life cycle objects for inclusion in the DSI.

Reuseable Ada Software

An inventory of public domain Ada software from NASA, DoD, other governmental organizations and private sector sources will be evaluated for inclusion in the DSI. Wherever possible, associated life cycle products will also be incorporated in the DSI.

Other Life Cycle Objects

In the process of software development, various life cycle products are generated, such as requirements documents, design documents, and test plans. In later phases of the project, the inventory of reusable objects will be extended to include these products.

Documentation

Standard documentation accompanying software components and life cycle products will be stored in the DSI. Standards or guidelines under evaluation for possible adoption include NASA SMAP DID's (Ada version) and MIL-STD-2167A. For standard life cycle and AdaNET specific documents, AdaNET developers are considering the adoption of the SGML ISO standard to develop Document Type Descriptions (DTD) representational markup.

Metrics

As objects pass through quality and performance tests, metrics will be collected to yield relative values in specific areas tested. Such information will be provided to users searching for objects in the reuse database as part of the extended profile information for objects in the DSI. Such information may help users to restrict their selection prior to making requests for object retrieval.

Profile Information

Each inventoried software object will have an associated profile. Current profile attributes being examined are:

- Identification Code
- Abstract
- Author
- Developing Organization
- Point of Contact
- Hardware/OS Requirements
- host
- target
- integration
- Compiler/Version
- Size
- Documentation Status
- Portability Report
- pragma usage
- dependencies on vendor supplied systems
- usage of low level I/O, memory addressing, etc.
- Problem Report

Reuse Database/Taxonomy

Objects in the DSI will be stored in the reuse database using a faceted classification scheme. This scheme will allow for a flexible database design. The design of the database will be independent of the data model used to ensure that it will not be constrained by the current "state of the practice". Guidelines for design will closely follow the EA/RA model and IRDS.

Retrieval/Duplication

Objects inventoried in the DSI may be retrieved through either on-line access or distribution media such as magnetic tape, diskette, or CD-ROM. For objects not available on-line in the DSI, on-line order processing will be provided.

Tutorials

This consists of instructional information on the use of the DSI, and on the use of inventoried components.

4.2.7 AdaNET Information Services (AIS)

This subsection describes the requirements for the AdaNET Information Services. Each of the separate databases will be structured according to the information contained in them. A common command structure will provide the powerful text retrieval access necessary and will function at the level of expertise desired by the user.

User Forums

A variety of bulletin board services, each relating to a general topic area will be developed. Current events, Special Interest Groups (SIGs), discussion forums, news and product information will be offered.

AdaNET Bibliographic System (ABS)

A bibliographic retrieval system will be available for texts identified as related to Ada and software engineering technologies. Some of the covered topics will comprise technical subject areas, costing and market information, and information available on related subject areas such as CIM/FCIM. Information will be accessed by key field/key word search categories, including article and periodical/publication references and abstracts.

Educational Materials

Access to or information about educational books, papers, video courses, overhead slide presentations, CAI tutorials and other types of educational materials about software engineering and Ada will be provided.

Electronic Communications

Internetwork electronic mail and document transfer services are available.

Full Text Information

Full text information relevant to software engineering, Ada and related technologies in the AdaNET library, that MountainNet is authorized to make available to AdaNET users will be provided. News and current events information will be included here.

Directories/Publications

Printed information about software objects in the DSI, and regular user updates concerning new and/or improved AdaNET services and activities will be available.

Other Repositories and Services

Information about known public and private software repository and information activities throughout the country for both Ada and non Ada software will be provided. Such repositories include the SIMTEL-20 ASR, NRL STARS repository, and NASA's COSMIC. Such information will include general information about the services provided by each of these facilities. Information regarding access and/or ordering, and in some cases, on-line or distribution access to software obtained from these sources (such as the ASR) will be supplied. However, software provided at this level of service will be virtually in an "as-is, buyer beware" format, and should not be confused with services provided through the DSI. This service is being made available to provide early access to Ada software currently in demand by the private sector, in the interim period during implementation of the DSI. Other information services may include access to SEAD and the Ada Information Clearinghouse (AdaIC).

4.2.8 Access Security

All systems now available on the MountainNet network have implemented tight systems security measures to insure the integrity and reliability of user data and applications. Security measures currently in place provide satisfactory protection; no breach of security has ever been experienced. However, as systems in the AdaNET configuration establish increasing visibility in the computing world, the highest level security possible must be implemented. As was stated earlier, the information on host systems available on the MountainNet network is unclassified. There are no plans to incorporate systems carrying classified information. Systems security measures are in place to insure privacy, integrity, and safety of user information stored on host systems, and in protecting host systems from the introduction of "worms" and "viruses" into the systems. Prior to making AdaNET services commercially available, it is anticipated that a security audit, conducted by an outside consulting firm, will be run, to reinforce current measures. Current systems security for systems in the AdaNET configuration include:

- Regular mandatory password changes
- Multiple passwords for privileged accounts, or accounts where requested.
- Restricted system privileges to a very few users in administrative positions and with a need for such privileges; on all systems currently in the configuration, only three users have such privileges for each system.
- Tightly controlled public accounts: accounts that are "public" (that have no password required for entry) give tightly controlled access to specific applications. Defensive measures are in place to ensure that users cannot "crash" these applications and obtain system entry. For planning of AdaNET systems services, public accounts (for applications for information or market survey collection), may be established on stand-alone systems (such as microcomputers) to insure main host systems security and internetwork systems security.
- Tightly controlled user accounts: as with public accounts, defensive measures are in place to provide secure user interactions.
- Archiving and backup that includes:
 1. Daily incremental backups of all systems
 2. Weekly system wide backups of all systems
 3. Off-site storage of backup tapes in secure environments
 4. Off-site storage of copies of archived information
 5. Contingency plans for backup systems to support the critical users, in case of disaster.

Continuing study and implementation of enhanced security measures should be performed. MountainNet expects to study trusted systems such as NSA's Trusted Computer System Evaluation Criteria (TCSEC) in future phases of AdaNET implementation.

4.3 Tasks and Deliverables

This section describes the tasks to be performed and the deliverables to be generated for this Technical Plan. It details the work to be performed and MountainNet's approach to its completion, which is in the form of specific deliverable items. These are:

- AdaNET System Design
- Data Gathering

- System Documentation
- AdaNET Information Services (AIS)
- Dynamic Software Inventory (DSI)
- Initial Network Introduction
- Growth Plan for Additional Services
- Spinoffs

4.3.1 AdaNET System Design

MountainNet views the design objectives of the AdaNET system as; 1) the storage of data and information in the most efficient manner for retrieval, and 2) the enhancement of interface functions to allow users to perform inquiries in the most effective manner. The AdaNET system is comprised of two main functional areas; the AdaNET Information Services (AIS) and the Dynamic Software Inventory (DSI). Each of these are dealt with in subsequent portions of this document.

4.3.2 Data Gathering

Data gathering will be an ongoing, dynamic process for AdaNET. Initial efforts will be important to the successful introduction of the service. To that end, MountainNet expects to perform a marketplace survey to determine the optimum mix of information for inclusion. In this way, early efforts can be expected to provide useful data to the user community and ensure AdaNET's early acceptance. This marketplace survey will be conducted among the most likely current users of software engineering and Ada technology. Specifically, MountainNet expects to survey and interview key individuals and organizations involved in SIGAda, AdaJUG, and academic institutions with ties to Ada and software engineering such as UHCL, Carnegie Mellon University, WVU, the University of Georgia, and the University of Maryland.

Interviews will be conducted with NASA TU and field center programs developing Ada technology applications, AJPO, STARS program and other DoD organizations including service labs and operational programs. Finally, MountainNet will contact it's largest potential constituency, aerospace and defense contractors. In order to ensure future potential growth, we will also interview the commercial divisions of these same companies. This will help determine the potential for commercial applications such as industrial and manufacturing automation.

The deliverable under this task will be the Phase III marketplace survey, which shall include conclusions and recommendations based on statistical analysis.

4.3.3 System Documentation

System documentation for AdaNET will take the form of descriptive, operational and maintenance information.

Descriptive information will include all organizational, business and technical plans called for under Subcontract No. 002 for RICIS project No. SE 18. These documents also include a schedule of user fees, and the agreement documents required to conduct AdaNET business activities.

Operational documentation will include the users guide; preliminary and detailed database design documentation; operational manuals for communications, data entry and update; and hardware/software Configuration and operational instructions. Maintenance information includes those items necessary to correct, enhance, or adapt the system. In addition to design documentation, detailed design requirements will be supplied. This documentation will be delivered as AdaNET is funded and the development program is underway. These documents will form an early deliverable on future program phases.

4.3.4 AdaNET Information Services (AIS)

This section discusses the design of the AdaNET Information Services. The AIS is the cornerstone of the AdaNET system. It represents that portion of AdaNET that we believe will yield immediate benefits as a technology transition and cost recovery mechanism. Further, AIS will provide a gateway function into the Dynamic Software Inventory (DSI) and other AdaNET services.

Clearinghouse functions are primarily dependent on the information and data provided by the clearinghouse itself. Therefore, a key element in design of the AIS is the data gathering and database design functions discussed in section 4.3.2 and in section 4.2.6. Planning these functions is tantamount to the preliminary design. The following paragraphs describe the minimal design frameworks for the AIS.

The following services have been defined:

- Bibliographic Information
- Electronic Communications/Document Transfer

- User Forums
- News & Current Events
- Other Repositories and Services
- Special Interest Groups
- Full Text Information
- Educational Materials
- Directories/Publications

The AdaNET Information Service (AIS) will provide a wide spectrum of information services to its user community. These services will be provided through on-line access and a mix of printed, CD-ROM, diskette and magnetic tape media.

The following paragraphs describe each service category and the projected first stage service offerings.

Bibliographic Information: This need will be met through a combination of AdaNET's library references and with existing library catalogues such as the SEI's library and publication lists from user forums and workshops. This feature will allow the user to glean information specifically regarding Ada, software engineering and related subjects and applications.

Electronic Communications/Document Transfer: Systems mail utilities will form the core service mechanism, linked to the applications user interface. When internetwork gateways are established, internetwork mail transfer will be established through use of standardized mail server protocols.

User Forums: AdaNET will keep an updated list, with accompanying information, of user forums available on the system. This list is intended to be a quick reference as well as an announcement medium. Software to support the actual forums is currently in place.

News & Current Events: This service will provide the user with excerpts from the press and highlight special events such as the International Conference on Software Engineering, Ada Expo, National Conference on Ada Technology, Ada contracts awards, and significant technology developments. This service will be designed using a text retrieval database system.

Other Repositories and Services: This information will guide the user toward existing repositories of reusable software systems and components. It will extend beyond Ada per se in that repositories of a more general nature such as NASA's COSMIC system of components will be referenced. Initially, only Ada software will be provided for distribution through AdaNET. Due to market demand, some software will be made available through AdaNET in "as is" form, taken from other public domain repository sources such as the ASR and NRL.

Special Interest Groups: Special interest groups abound in the Ada world, the most visible of these being SIGAda. However, groups are formed based on "birds of a feather" sessions at conferences and workshops. Other non Ada specific groups require information about the current status of Ada. The Electronic Industries Association and the National Security Industrial Association each have software subcommittees concerned with Ada and software engineering. Further, Ada may become a significant factor in the DoD's Computer-aided Acquisition and Logistics System (CALS) initiative. Each of these special interest groups will most likely be willing to share data and become users of AdaNET.

Full Text Information: This is one of the most significant services AdaNET will offer. It will provide information on Ada projects throughout the industry and act as the host for abstracting certain items of documentation from those projects. For example, if a management overview of the Space Station SSE were to be available through AdaNET, its dissemination to the marketplace would be greatly enhanced. In addition to project information, public domain documents basic to Ada, such as standards, will be made available as is possible.

Educational Materials: Because use of software engineering and Ada technology requires an extensive re-education effort, educational information will be provided. Actual course description and curriculum designs, as well as references to a whole range of educational materials including Computer Based Training (CBT), video tapes, films, etc., will be available.

Directories/Publications: In order to make the AdaNET system as easy to use and widely familiar as possible, a set of printed information is being developed. These publications will include a catalog of services available, user reference guides, and brochures describing AdaNET.

4.3.5 Dynamic Software Inventory (DSI) Design

The design of the DSI has been divided into the four functional areas:

- Object Evaluation
- Object Inquiry
- Object Retrieval
- Library/Systems Configuration Management

During first stage of DSI design the majority of work will concentrate on implementation of the first three categories, with development of a Configuration Management Plan. The following sections describe planned design implementation for each of these component areas.

Object Evaluation

Each candidate object must undergo testing and evaluation as part of its incorporation into the DSI library. Software objects will be evaluated for:

- *Completeness*: Determine if all necessary components have been provided to allow successful compilation and execution of the software object;
- *Portability*: Check for features that compromise portability;
- *Errors/Constraints*: Determine constraints placed on variables and types; test robustness of error handling;
- *Complexity*: Determine the component's relative code complexity;
- *Performance*: Run benchmarks against software components;
- *Classification*: Assign facet terms;

Results of each phase of the evaluation will yield the unit's profile, which is entered into the reuse database for user retrieval and evaluation.

The following steps will be taken to develop the software evaluation process:

- Identify initial parameters/procedures for evaluation;
- Document such parameters in an AdaNET Reuse Policy and Guidelines manual;
- Develop procedures for completeness testing;
- Identify features to test for portability analysis;
- Develop procedures for object portability analysis;
- Develop automated portability analysis procedures;
- Identify complexity analysis tool(s) to be used;
- Develop method for applying tool(s) to software objects;
- Develop automated methods to generate the object testing framework;
- Develop method for facet terms assignment;

- Develop procedures for object classification.

Object Inquiry

Access to objects available or inventoried by AdaNET will be provided through a reuse database. The database will contain results of evaluation testing to provide potential reusers with a profile of the software object. Information such as object type, function, functional area, algorithm and system information will be provided as terms defined for the various facets that make up an object descriptor. Key design activities include:

1. Domain analysis of objects;
2. Facet definition;
3. Assignment of initial facet terms;
4. Classification of a representative sample of programs;
5. Design database.

Object Retrieval

To form an object descriptor, the user chooses facet terms under each facet. In order to examine specific objects resident in AdaNET libraries, one of two actions, depending on object size and other criteria, is taken:

1. On-line object retrieval initiated
2. On-line ordering request initiated

For objects that can be provided on-line, the files referenced by the object descriptor will be returned to the user. The user may then select which specific objects are desired. The associated files are then transferred to the retrieval system to be downloaded. Items that must be ordered become open orders and are entered into AdaNET's distribution center. Accounting information provided by users will allow direct billing for all distribution requests.

Development of the retrieval system will consist of:

- System requirements definition;
- Top level design of object retrieval system;
- Systems communications design;
- Database/retrieval system interface design;
- Retrieval system/distribution system integration design;
- Retrieval system implementation.

Library/System Configuration

A Configuration Management Plan defining policies and procedures for DSI management will be developed. Issues to be addressed in this document include such areas as:

- Object insertion into reuse database;
- Object modification/revision;
- Multiple version tracking;
- Life cycle object collection management;
- Maintenance history;
- User problem report notification.

4.3.6 Initial Network Introduction

The initial introduction of AdaNET will be based on one overriding principal: only that which is available and operational will be included. In this way, AdaNET can ensure that user expectations don't exceed the systems capabilities prior to feature availability. Clearly one of the most important aspects of the introduction process is the public announcements about the service. In order to clearly specify the overall plan, we will state the shorter range goals and follow that with longer term commitments.

The primary goal for the short term (May - October 1988) is the implementation of services to be offered commercially beginning with the TRI-Ada '88 meeting. This represents the first step in making the AdaNET project self-sustaining on a for-profit basis. The TRI-Ada '88 meeting will be held in Charleston, West Virginia, October 24-28. Services to be announced at the meeting are:

- The existing Ada Software Repository currently on the SIMTEL20 system at White Sands Missile Range with some value-added services and other software inventoried at that time;
- Electronic mail linking members of the Ada community;
- User forums and information services.

Activities Activities during this period will be in the following areas:

- Implementation of commercially available Dynamic Software Inventory (DSI);

- Implementation of commercially available AdaNET Information Services (AIS);
- Preparation for TRI-Ada '88 marketing effort;
- Planning for additional services to be made available in future phases of implementation;
- Identify other repositories to be referenced through AdaNET;
- Identify software tools useful in performing software evaluation and configuration management functions for AdaNET;
- Develop an EA/RA model of repository with faceted classification;
- Build a list of potential additional services to be offered by AdaNET;
- Attend relevant conferences and trade shows.

4.3.7 Growth Plan for Additional Services

This section specifies the plans for AdaNET's growth and the additional services that will be incorporated. It includes medium and long term goals for spinoffs, additional repositories, software and communications.

Spinoffs

As AdaNET evolves, other spinoff services will be pursued. Such services include:

- Consultant services to aid manufacturers in their transition from traditional technologies to Ada based CIM/FCIM technologies.
- Consultant services to private sector organizations in their development of reusable software components inventories.
- Expansion to the international Ada technology market; AdaNET may be able to serve as a technology transfer medium for software engineering and Ada technology developed overseas to the United States market.

During first stage implementation of the DSI, inventoried objects will be exclusively from the coding and unit testing stages of the software life cycle. This limitation is a consequence of the fact that we will be first evaluating existing Ada source code components obtained from public domain sources such as the ASR, NOSC Ada tapes, and other identified existing Ada repositories. Initial minimal evaluation criteria are being developed,

and will form the basis for quality evaluation for potential reusability at this components/subcomponents level. These requirements will be detailed in the document AdaNET Reuse Policy and Guidelines during this first stage of implementation. It is anticipated that this document will be expanded to include all life cycle products incorporated into the AdaNET inventory during future phases of DSI implementation. From these guidelines, standard procedures for component evaluation will be developed to analyze quality. MountainNet's long term goal for implementation of the AdaNET DSI is to develop a system that will implement the life-wide object representation model proposed by Dr. Charles McKay, Director of the Software Engineering Resources Center (SERC) at the University of Houston at Clear Lake City. MountainNet's development team recognizes that the true benefits of reusability will come only when life wide information about available software components can be offered to AdaNET users.

MountainNet is balancing the longer term development of this model against the current need to provide access to reusable software in a fairly short time (i.e., within the next year). For this reason, we emphasize in the current document the planning for a DSI of reusable software designed to provide growth and expansion that will allow later evolution to Dr. McKay's proposed taxonomy of taxonomies, but that can be realistically implemented within the time frames described herein.

Medium Term

The following subsection describes medium term (1-2 yrs) goals for AdaNET services.

The primary goals over the medium period (November 1988 - December 1989) include:

- Provide additional value-added services for the DSI;
- Identify and/or develop tools for decomposition and recomposition of total software systems into reusable components and modules;
- Incorporate other repositories within the AdaNET taxonomy;
- Identify existing Ada software that can be used for CIM/FCIM applications.

The following list of planned activities is grouped according to the four goals listed above.

Additional Value-Added Services: Activities related to the provision of additional value-added services to the repository include:

- Testing for correct behavior
- Classifying according to Booch's taxonomy
- Improving user documentation and tutorials
- Widening the range of evaluation applied to units

Tools for Decomposition and Recomposition: It is anticipated that large systems of Ada software developed for the federal government will eventually be delivered to the AdaNET project for evaluation, decomposition into reusable units, and inclusion in the DSI. To assist in this activity, the technical team will need access to software tools for detecting reusable portions of code and for decomposing large systems into smaller ones. Initially, tools for measuring cohesion and coupling would be useful. The necessary procedures are:

1. Identify candidate tools and metrics;
2. Learn to use these tools;
3. Determine their utility in assisting with the decomposition of systems;
4. Construct other needed tools.

Other Repositories: Several collections of reusable Ada code are well-known in the Ada community. These include the ASR, CAMP, STARS Foundations, the Booch Components, and GRACE components. Each of these collections has its own organization. AdaNET will provide references to units in other repositories. AdaNET will attempt to provide a thesaurus to support context dependent specifications used by each affiliated repository and add unit references to the reuse database.

Existing Ada Software: The DOC OPTI support of AdaNET is provided to stimulate leadership in development of CIM/FCIM Ada technology applications. AdaNET will attempt to work with mature leaders in CIM/FCIM applications, to build a base of Ada technology in support of this technology.

Long Term Goals

The goals over the long term period (January - December 1990) are:

- Link services provided directly by AdaNET with those provided by other systems such as the AdaIC bulletin board and SEAD;
- Develop and provide support and expertise for companies making transition to the use of automation technologies;
- Develop expertise to provide help in selection of computer hardware and software development tools best suited for specific applications development.

4.4 Quality and Standards Assurance

This section of the technical plan states AdaNET's verification requirements and details a validation demonstration to meet those requirements. MountainNet plans to follow basic software engineering principles in the evolution of AdaNET. To this end, a section on "Process Standards Compliance" is included.

4.4.1 Verification Requirements

This subsection addresses the way in which AdaNET requirements will be verified as complete. Since AdaNET is more than the software which drives it, this subsection also deals with those items which are important to the overall implementation of AdaNET, but not necessarily software. For example, AdaNET's requirement to distribute information in printed, CD-ROM and diskette format will be proven to be complete through the creation of information using these formats, which will then be forwarded to UHCL.

This subsection first lists each requirement as stated in section 4.2 of this document, then follows that with the plan for proof the requirement has been met. Please note that an overall system demonstration is planned and is covered in section 4.4.2 "Validation Demonstration".

Networking and Communications

This requirement will be verified through remote login to AdaNET through the existing network schema. The logins will take place at the UHCL facility and will be performed in the following manner:

- Login through the Telenet access to AdaNET;
- Login to MountainNet directly;
- Login to AdaNET directly.

In each case, the record of the login sequence will be saved and printed to show proof of performance.

Hardware

Verification of existing hardware cannot be accomplished in the traditional sense, nor does it need to be. Since AdaNET is using existing services, MountainNet plans to provide initial signature pages for the agreements between MountainNet and the vendors of those services.

Software

There are two types of software verification for AdaNET. One is the testing of software which is to be included in the Dynamic Software Inventory (DSI). Since this is a separate subject, it will be dealt with in subsequent deliverables. The second is verification of the software developed for AdaNET. MountainNet will follow standard testing procedures for software. Standard testing procedures include:

- Unit test all code during development. These tests will be conducted by the software engineer responsible for that piece of code;
- Build tests that will be conducted using stems and stubs, as appropriate;
- Sub-system testing will be conducted as supersets of each build test;
- In all cases, software engineers will follow internal MountainNet Software Test Plan.

Data and Information Sources

Verification of Data and Information sources will be verified by supplying UHCL with duplicate copies of the agreements signed by the supplier with AdaNET.

Operational Considerations

Operational aspects of AdaNET will be confirmed through copies of required deliverables from this subcontract.

Dynamic Software Inventory (DSI)

The DSI will be a constantly changing entity. However, verification of its robustness will be accomplished through publication of the contents and internal monthly reports detailing problem areas, new additions and deletions and planned activities for expansion. In this way, a running record of the DSI will be kept, allowing an historical perspective for future changes.

Database

Database access and security will be tested and proven through the Validation Demonstration. Although MountainNet has not chosen a specific database management system vendor, it is anticipated that a key element in vendor selection will be the access, security and record/element administration functions available.

AdaNET Information Services (AIS)

Beyond the testing for software discussed in section 4.4.1, the AIS will be tested for clarity and ease of use. Most of this testing will take place in preparation for the Validation Demonstration discussed in the next subsection.

4.4.2 Validation Demonstration

The ultimate test of any service-oriented endeavor is the application itself. Since fielding a new system will always uncover unanticipated problems, the most valid test for such a system is a validation demonstration. MountainNet plans a two-phased approach to this demonstration. These are:

1. Demonstration to UHCL/RICIS and;
2. Demonstration to NASA headquarters and the liason office for Sen. Robert Byrd.

Primarily, the demonstration will take the form of accessing AdaNET then allowing the user to browse through the services offered. In this way two key elements will be addressed; one, access and availability and; two, ease of use. MountainNet will perform these tests internally with non computer-literate personnel prior to the live demonstration.

4.4.3 Process Standards Compliance

Processes have helped most engineering disciplines overcome the problems associated with the design and implementation of a given system. Although the term "software engineering" was coined more than twenty-five years ago, the process of software engineering is just beginning to become a practiced method of development. MountainNet plans to comply with NASA's SMAP methodology in development of AdaNET. Although not entirely a software subsystem, AdaNET can benefit now and in the future by compliance with this disciplined approach to development.

Quality Assurance practices will take into account each phase and step of SMAP, and ensure that each is measurable and accurate. Additionally, MountainNet will employ the practices espoused by Dr. Roger Pressman in his book, *Software Engineering - A Practitioners Approach*.

Process standards compliance will be measured based on the stated goals in Dr. Pressman's volume. Finally, MountainNet recognizes the need to track this measurement, and will do so with modified versions of a "module development folder". Each functional area will receive it's own folder which will be kept by the chief programmer or administrator for the team charged with accomplishing the goals of that functional entity.

4.5 Additional Resource Requirements

This section of the technical plan delineates additional resources needed in order to meet the objectives surrounding a viable AdaNET service. It specifies the needs associated with hardware, software, networking and communications and personnel and administration.

At this point in time, it's understood that additional resources are contingent upon additional contracting dollars not yet allocated. MountainNet is also pursuing further corporate partnering agreements with an eye toward baseline funding for expansion.

4.5.1 Hardware

Specific hardware additions are:

- VAX 8500 and/or other VAX systems to support a greater number of users and distribution of services requiring competing resources;
- Harris HCX9 to expand the in-kind services currently being supplied by WVU;

- Terradata DBC/1012 to serve as a standalone Reuse Database system;
- IBM 9370 (MVS) to support the Terradata.

4.5.2 Software

Software required to expand AdaNET is:

- COTS software for to provide compatibility between DEC and DG computers;
- COTS implementation of SGML;
- COTS implementation of IRDS;
- COTS development tools and environments;
- Relational Data Base Management software (prior to incorporation of dedicated database machines.

4.5.3 Networking and Communications

Networking and Communications needs are:

- A star network controller;
- Direct connection between AdaNET and Telenet for ease of access;
- Direct lines to the RICIS at UHCL, Washington, D.C., Huntsville, Boston and Pittsburgh;
- A link into the NASA network;
- A link into the DoD's DDN. This is an imperative connection in order to become the foci for Ada-related information services;
- A direct connection between AdaNET and SEAD.

4.5.4 Personnel

Development team personnel required for first stage implementation are 10 FTE staff members plus senior level software engineering consultants. These staff positions will be divided among:

- 6 Software Engineers
- 1 Library Information Systems Specialist
- 1 Systems Analyst
- 2 Programmers

4.5.5 Administrative

Estimated administrative resources required for first stage implementation include:

- 3 PC AT compatible microcomputer systems with expanded memory
- 3 PC compatible printers
- 1 MacIntosh II
- 6 Computer workstation desks

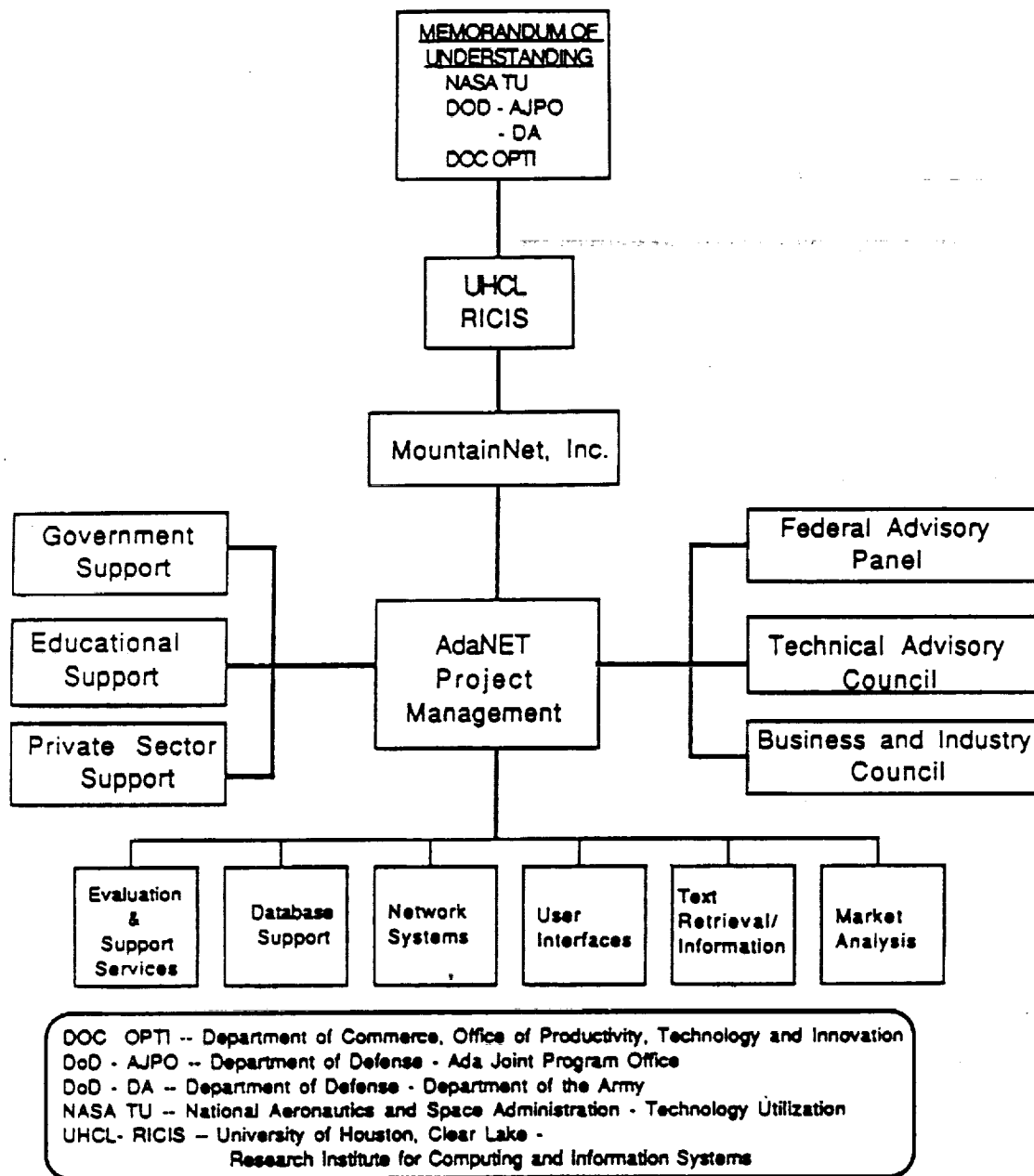


Figure 4.5: AdaNET Organizational Structure

4.6 AdaNET Research Project

June 1, 1988 through October 31, 1988

The following is a list of proposed deliverables and milestones to be established for the next phase, first stage implementation, of AdaNET development:

Description	Milestone	Deliverable	Start*	Finish*
1.0 Phase I/II Final Report		Y Y	1	6
2.0 Develop Planning Documents				
2.1 Draft One Year Plan		Y Y	5	10
2.2 Revise One Year Plan		Y	11	14
2.3 Final One Year Plan		Y Y	15	16
2.4 Draft Five Year Plan		Y Y	17	20
3.0 AIS System Research				
3.1 Develop Draft System Plan		Y	5	12
3.2 Release Draft System Plan		Y Y	13	16
3.3 Revise Draft System Plan		Y	17	19
3.4 Release System Plan		Y Y	20	21
4.0 DSI System Research				
4.1 Develop Initial System Plan		Y	5	16
4.2 Release Initial System Plan		Y Y	17	20
4.3 Revise Initial System Plan		Y	21	23
5.0 Tech. Adv. Council Implementation				
5.1 Council Selection		Y 7		8
5.2 Council Approval		Y Y	9	9
5.3 Meeting Notice		Y	11	11
5.4 Meeting		Y Y	15	15

* Week number during development phase that activity begins and completes.

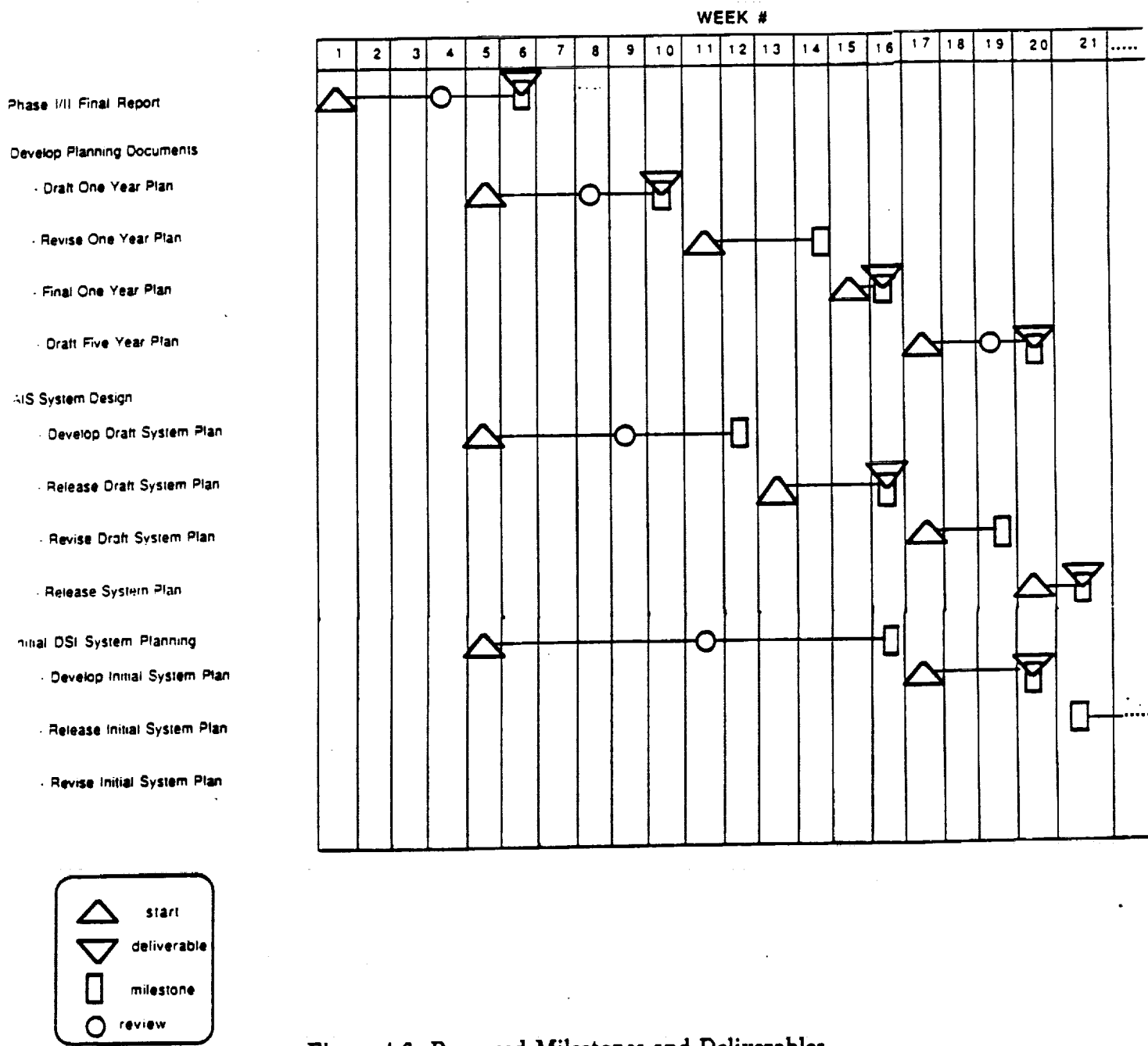


Figure 4.6: Proposed Milestones and Deliverables

Chapter 5

Revenue Plan

5.1 Overview

This document is the Revenue Plan for implementation of MountainNet's AdaNET project. Additionally, the document represents a deliverable item under Cooperative Agreement #NCC9-16.

AdaNET is designed to provide government-developed Ada technology information to:

- Industrial and manufacturing organizations
- Educational institutions
- Small business and other private sector organizations
- Governmental agencies

The information available through AdaNET will be offered with accompanying value-added services, making it a gateway and clearinghouse for software engineering and Ada technology that is unique. These services will be offered through a cost recovery structure that provides for migration to full commercial viability.

This chapter describes what is to be offered to defined market segments, sources of Ada software and technology, revenue structures, reimbursement of direct contribution and comparative pricing.

5.2 Products and Services

Services to be offered are defined as one of three specific services categories:

- Dynamic Software Inventory
- AdaNET Information Services
- Professional Support Services

The following subsections provide descriptions of specific services to be offered under each of these categories:

5.2.1 Dynamic Software Inventory (DSI)

The Dynamic Software Inventory consists of software (and other life cycle objects) within an environment developed to support ease of definition and access to information about objects for reuse.

Reusable Ada Software

An inventory of public domain Ada software from NASA, DoD, other government agencies and private sector sources will be evaluated for inclusion in the DSI. Wherever possible, associated life cycle products will also be incorporated in the DSI.

Other Life Cycle Objects

In the process of software development, various life cycle products are generated, such as requirements documents, design documents and test plans. In later phases of the project, the inventory of reusable objects will be extended to include these products.

Documentation

Standard documentation accompanying software components and life cycle products will be stored in DSI. Standards or guidelines under evaluation for possible adoption include NASA SMAP DID's (Ada version) and MIL-STD-2167A. For standard life cycle and AdaNET specific documents, AdaNET developers are considering the adoption of the SGML ISO standard to develop Document Type Descriptions (DTD) representational markup.

Metrics

As objects pass through quality and performance tests, metrics will be collected to yield relative values in specific areas tested. Such information will be provided to users searching for objects in the reuse database as part of the extended profile information for objects in the DSI. This information may help users to restrict their selection prior to making requests for object retrieval.

Profile Information

Each inventoried software object will have an associated profile. Current profile attributes being examined are:

- Identification Code
- Abstract
- Author
- Developing Organizations
- Point of Contact
- Hardware/OS Requirements
 - host
 - target
 - integration
- Compiler/Version
- Size
- Documentation Status
- Portability Report
 - pragma usage
 - dependencies on vendor supplied systems
 - usage of low level I/O, memory addressing, etc.
- Problem Report

Retrieval/Duplication

Objects inventoried in the DSI may be retrieved through either on-line access or distribution media such as magnetic tape, diskette or CD-ROM. For objects not available on-line in the DSI, on-line order processing will be provided.

Reuse Database/Taxonomy

Objects in the DSI will be stored in the reuse database using a faceted classification scheme. This scheme will allow for a flexible database design. The design of the database will be independent of the data model used to ensure that it will not be constrained by the current "state of the practice". Guidelines for design will closely follow the EA/RA model and IRDS.

Tutorials

This consists of instructional information on the use of the DSI, and on the use of some specific inventory components (such as tools, training systems or complete operational systems).

5.2.2 AdaNET Information Services (AIS)

This subsection describes the requirements for the AdaNET Information Services. Each of the separate databases will be structured according to the information contained in them. A common command structure will provide the powerful text retrieval access necessary and will function at the level of expertise desired by the user.

User Forums

This service consists of a variety of bulletin board services including current events, Special Interest Groups (SIG's), forum discussions, news and product information.

AdaNET Bibliographic System (ABS)

A bibliographic retrieval system will be available for texts identified as related to Ada and software engineering technologies. Some of the covered topics will comprise technical subject areas, cost and market information, and information available on related subject areas such as CIM/FCIM. Information will be accessed by key field/key word search categories, including article, periodical and publication references, and abstracts.

Educational Materials

Access to or information about educational books, papers, video courses, overhead slide presentations, CAI tutorials and other types of educational materials about software engineering and Ada will be provided.

Electronic Communications

Internetwork electronic mail and document transfer services will be provided to support communication with other Ada software engineering professionals.

Full Text Information

Full text information relevant to Ada, software engineering and related technologies in the library, that MountainNet is authorized to make available to users of AdaNET. News and current events information will be included here.

Directories/Publications

Printed information about software objects in the DSI and regular user updates concerning new and/or improved AdaNET services and activities will be made available.

Other Repositories and Services

Information about known public and private software repository and information activities throughout the country for both Ada and non-Ada software will be provided. Such repositories include the SIMTEL-20 ASR, NRL STARS repository and NASA's COSMIC. Such information will include general information about the services provided by each of these facilities. Information regarding access and/or ordering, and in some cases, on-line or distribution access to software obtained from these sources (such as the ASR) will be supplied. However, software provided at this level of service will be virtually in an "as is, buyer beware" market composition format, and should not be confused with services provided through the DSI. This service is being made available to provide early access to Ada software currently in demand by the private sector, in the interim period during implementation of the DSI. Other information services may include access to SEAD and the Ada Information Clearinghouse (AIC).

5.2.3 Professional Support Services

Consultant Services

MountainNet's staff and companies comprising the project support infrastructure will be available for specialized software engineering and Ada technology consultant services. This service will be key to successful use of the AdaNET services, and will be essential to the catalyst role of encouraging transition to use of Ada technology in private sector initiatives.

Seminars and Workshops

Seminars and workshops will be provided to educate and train the user base.

5.3 Target Market

The following sections define target markets identified as potential users of the AdaNET services:

5.3.1 Market Segments

The target market can be divided into the following categories:

- Current Ada users
- New entrants into the Ada market
- Industrial and manufacturing organizations
- Government agencies
- Educational institutions

The current Ada users market represents the most immediate market for AdaNET. Based on preliminary data, the professional Ada community has specific interest in baseline services planned. Of particular interest is reusable software components, supporting value-added services, professional papers and general information services such as, market trends and information about contract opportunities. Major users in this area are currently the aerospace industry and defense contractors.

Market entry into the industrial and manufacturing areas will require a more prolonged effort. Significant pre-market education will probably be required for industry segments to see the direct advantages of applying Ada technology to their unique applications. Specific component taxonomies relative to manufacturing primitives, will be adopted, similar to the approach used in presentation of the Common Ada Missile Packages (CAMP) software to inventory software parts primitives. Educational and consultant support for successful long-term Ada technology migration in such areas as Paperless Order Processing (POP), Just-In-Time Inventory (JIT), Computer Integrated Manufacturing (CIM), Flexible Computerized Manufacturing technologies (FCM) and other real time control systems will also be provided.

The government market represents a stable, proactive environment for AdaNET use. Although AdaNET's purpose is the transfer of government developed Ada technology to the private sector, available technology and applications within various government agencies and even within various divisions of the same agency will also be inventoried where appropriate. For educational institutions interested in gaining Ada technology expertise in order to introduce strong Ada and software engineering curriculums, high quality information will be available from AdaNET.

5.3.2 Market Composition

Several major professional areas within each market segment have been identified:

- Software Engineers/Developers currently working with software engineering and Ada technology have expressed interest in Ada and software engineering, methodologies, Ada specific metrics, reusable software and faceted classifications.
- Managers/Administrators within commercial and government organizations have shown interest in services that provide contracting and subcontracting information, current events, market trends, governmental activities with respect to the use of Ada and information about companies and products in the Ada market.
- Educators indicated interest in educational and technically oriented information such as, faceted classifications for reuse and Ada tutorials.
- Members of manufacturing and industrial communities are interested in the place of Ada technology as part of the overall advanced technology solutions

to increase productivity, competitiveness and reliability. Areas of interest include information about educational and professional information, current industrial applications and information about companies that possess specific areas of Ada technology expertise.

5.3.3 Initial Market Survey

An initial survey for AdaNET was conducted at the Ada Expo '87 held in Boston in December 1987. The survey, while a small sampling of those in attendance, yielded information about the Ada community's current interests. The survey gathered the following types of information:

- General demographic information
- Ada application areas represented at the conference
- Levels of interest in potential service offerings
- Current hardware and telecommunications utilization

Following are charts which summarize the data collected in the initial market survey.

Survey of Ada Expo '87 Attendees
Areas of Ada Software Development

AREA	FREQUENCY	PERCENT
Weapons/C3i	39	16.9
Engineering	35	15.2
Tools	28	12.1
Scientific	21	9.1
Telecommunications	20	8.7
Education	18	7.8
Databases	18	7.8
Business/MIS	17	7.4
Compilers	14	6.1
Process Control	8	3.5
Financial Applications	6	2.6
Consumer	6	2.6
Chemicals/Petroleum	1	0.4

Survey of Ada Expo '87 Attendees
Networks Utilized

NETWORK	FREQUENCY	PERCENT
ARPA NET	32	33.3
DDN	20	20.8
Telenet Mail	15	15.6
Compuserve	12	12.5
BITnet/Mailnet	9	9.4
The Source	4	4.2
Dialcom	2	2.1
NASA Mail	2	2.1

Survey of Ada Expo '87 Attendees
Usefulness of Service Categories

USAGE	SUM OF RATINGS
SW Eng. Methodology	130
Ada-Specific Metrics	112
Reuse Classifications	100
Topical Search	97
Documentation	93
Project Management	91
Commercial	77
User Communications	69
Contracting	67
On-Line Tutorial	57
Telephone Help Line	51
CBT	50

0 = Not Useful; 1 = Useful; 2 = Very Useful

5.4 Sources of Ada Software and Technology

5.5 Revenue Structures

Careful consideration is being given to the approach taken in planning for services cost recovery (or revenue) structures. Current thoughts and approaches being taken in development of this structure are discussed below. This document does not attempt to define specific dollar amounts for services structures. Such activity is premature, due to a lack of information about total investment in development of services; specific operational costs of supporting services delivery; resource requirements and allocations necessary for delivery of various services and specific information about potential market demand for individual or group services. Such information will become available and realistic projections possible in future phases of the project, as it moves from planning, research and early prototyping into full scale services implementation. Criteria that must be met by the revenue structure include:

- Defraying costs of operation
- Maintaining commercial competitiveness
- Standardizing revenue structures
- Implementing incentive programs
- Providing economically disadvantaged discounts
- Reimbursing of direct contributions

The revenue structure will utilize standard subscriptions, incremental charges, purchase fees and a differential fee structure as described below. These structures will be based on high volume usage, rather than charging individual users premium prices as the service goal is to provide reliable information services at cost effective rates. The most common structures to be used will be:

Subscription Rate

An annual, quarterly or monthly base rate allowing access to services (or groups of services) through on-line connect, CD-ROM, diskette and printed media.

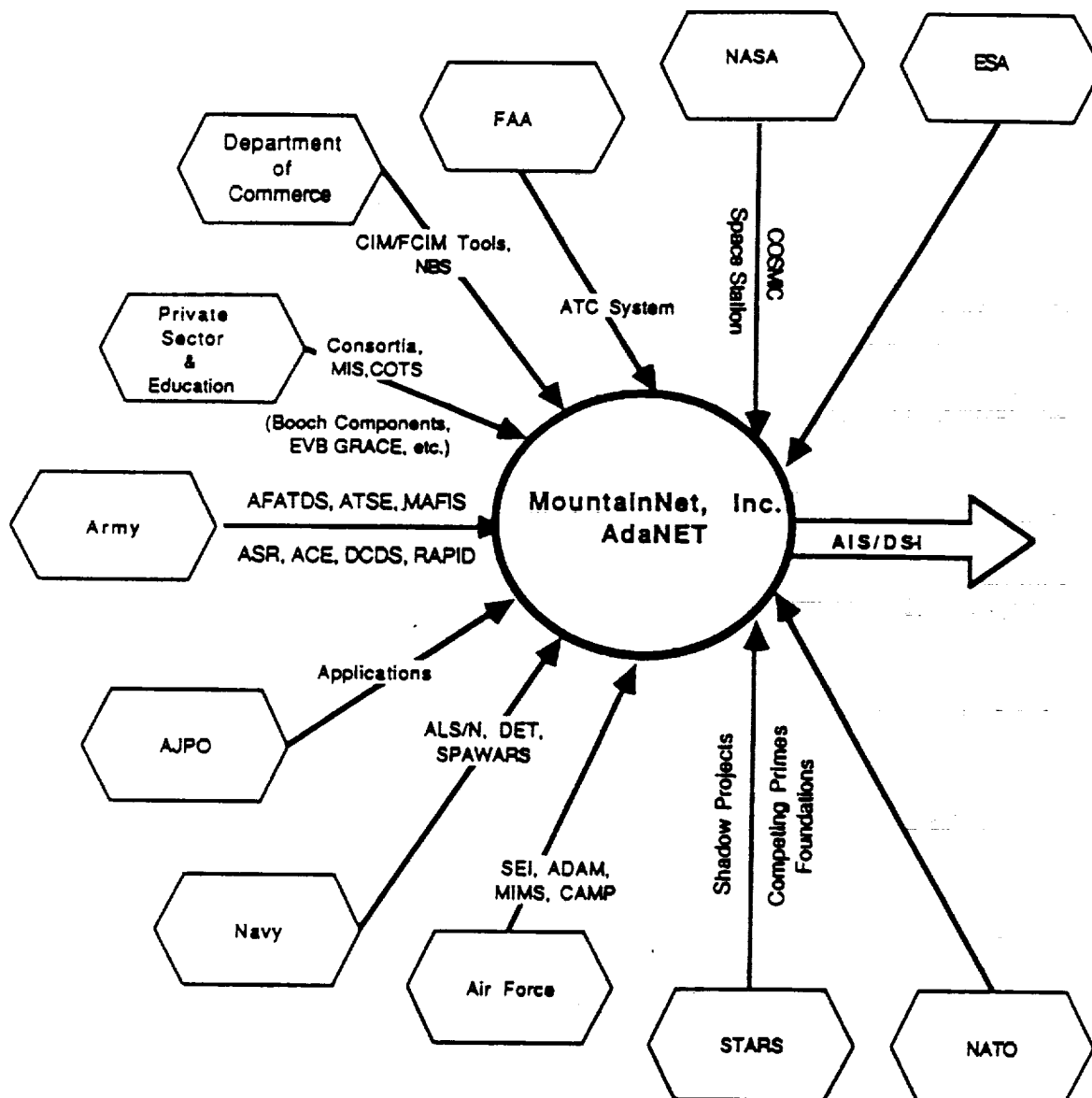


Figure 5.1: Source of Ada Software and Technology

Incremental Rate

Users "pay as they go" for on-line services not standard to their regular services subscriptions.

Purchase Price

Users purchase products on an individual unit basis.

Differential Fee Structure

Usage information will be collected as clients log onto the system. This data will include:

- Log-on time
- Log-off time
- Number of disk accesses
- Amount and kind of data down-loaded to user's system
- Types of information retrieved

In all cases, MountainNet understands that the difference between data and information will make a difference in billing for a given session. For example, if a client retrieves data which points him toward another resource for information, he will be billed less than if the retrieval nets information which is unavailable elsewhere. This logic follows an automated path for traditional information and data services; i.e., the Auerbach Report. Although not automated, a substantial fee is charged. The difference with this service is that the user will be billed for only the information retrieved and not for all of the information in the database.

Revenue Classes for AdaNET Services

Description	Distribution Medium						
	On-Line	CD-ROM	Tape	Diskette	Hardcopy	Misc.	Live
Dynamic Software Inventory	ISP	SP					
Ada Software Components	IS	SP	P	PS			
Documentation	IS	SP	P	PS	P		
Metrics	IS	SP	P	PS			
Profile Information	IS	SP			P		
Reuse Database/Taxonomy	IS	SP					
Tutorials	IS	SP	P	P	P		
Information Services							
User Forums	IS				S		
Bibliographic System	IS	PS			PS		
Educational Materials	IS	PS	P	PS	PS		
Electronic Communications	S						
Full Text	I	PS	P	P	PS		
Directories/Publications					PS		
Outside Services	S						
Professional Support							
Consultant services							P
Seminars and Workshops							P

I = Incremental

S = Subscription

P = Purchased

5.5.1 Defraying Costs of Operation

As a minimum requirement, revenue structures established for services must provide a realistic basis for cost recovery for a given target number of users. Below are estimated resource requirements at full staffing. Costs for these resources do not include variable costs associated with specific services delivery.

Human Resources

Type of support	Number of FTE*
General information services	4
Library information services	1 1/2
Software evaluation	5
Configuration management	2
Database	2
Distribution personnel	3
Marketing/Advertising	2
Network and systems	3
Infrastructure support services	4

*FTE = Full Time Equivalent

Hardware/Software

- Six (6) Large scale computer systems
- Network support
- New acquisition and maintenance of software
- Administrative and travel expenses

Notes:

The estimated number of FTE's in various activity centers are based on current knowledge of staffing needs, as well as comparative staffing requirements in similar programs, such as the USAISEC SDC-W RAPID program. Estimates on other expense areas are projected for current operational costs.

5.5.2 Maintaining Commercial Competitiveness

AdaNET must be competitive (as a minimum) with comparative commercially available services. The difference between minimum charge scales necessary for cost recovery and current market rate structures for similar services establishes a margin within which there is flexibility for determination of revenue structures (see Section 6 for comparative pricing rates).

5.5.3 Standardizing Revenue Structures

Revenue structures must be standardized with few "add-on" charges for specific services usage (see Section 6 for comparative pricing structures). For most on-line services, standardized subscription services will be introduced, at levels that will allow cost recovery of resources expended for services delivered at average usage levels. Services would be "packaged" in incremental subscription levels. This will allow delivery of highly affordable general services (hence removing economic barriers). It will also allow alternate cost recovery structures (such as those listed in Section 6) for services delivering strategically valuable or resource intensive information.

5.5.4 Implementing Incentive Programs

Attractive pricing and/or special incentives to induce use of services and reinsertion of information by U.S. and foreign businesses and government organizations will be provided. Such programs may include introductory service "credits" to organizations providing valuable technology reinsertion, hence providing an additional incentive to encourage continued use of the services.

5.5.5 Providing Economically Disadvantaged Discounts

Special pricing discounts to remove economic barriers to access of information by qualifying educational or small business users will be provided. These market segments generate potentially less expendable revenue that can be used for investment in new technology areas, this may present an economic barrier to entry in new technological markets. Use of software engineering and Ada technology by these market segments will be encouraged. Specific qualifications for such discounts remain to be determined; criteria used must be easily obtainable and verifiable, and not represent high resource requirements in supporting

such verification. By establishing such a pricing structure in the form of a discount, the established standard pricing structure is not eroded by non-standard fee structures available to special groups of users. Not all small businesses and educational institutions will meet criteria established for these discounts, and should legitimately be charged standard rates.

5.5.6 Reimbursing of Direct Contributions

Reimbursement of direct contributions of sponsoring governmental agencies will be made. This reimbursement will be realized through the value of technology transferred for reuse by public and private sector users of AdaNET. Methods are currently being developed to analyze the relative value of various information components distributed so that a reuse value of that information can be established. Within ten years, the total value of that information should be greater than or equal to the original governmental investment.

5.6 Comparative Pricing

Below is a description of pricing strategies used by various companies that offer similar types of information services and products. These do not reflect the proposed fee structure for the AdaNET services, but rather are indicative of existing market pricing strategies. These services include on-line information services, information provided through alternate distribution media, and consultant and educational services.

5.6.1 On-Line Services Delivery

The following revenue categories are related to delivery of on-line communications networks, provided through telecommunications network access.

Communications Fees

Fees associated with communications networks access, such as TYMNET and TELENET. These fees vary based on geographic location, data transmission speed and the availability of a local dial-in number to access services. Fees generally range from a few dollars per hour to over \$30.00 per hour depending on data transmission speed and which subservice is accessed.

Connect Time Charges

Connect time charges are based on the amount of time the user is actually connected to the system. Rates are quoted on a per hour basis and are dependent upon the type of information and subject matter required. Business and technical information are available at higher rates than citations and abstracts. Databases that provide citations and abstracts to publications usually cost less than those that provide information such as, a company's name or address or a history of stock quotations for a particular industry. Connect time fees can range from \$15.00 for access to subsets of several files for teaching purposes to \$300.00 for access to citations for chemical patents.

Print or Display Charges

Print or display charges are assessed for each record displayed on the screen or printed offline. The fee varies as a function of the amount of information provided. Little or no charge is associated with viewing the title and subject headings for a record. Fees ranging from \$.10 to \$4.00 can be associated with viewing enough information to allow user to obtain the item which is being searched or for actually displaying the information. Files that allow the user to create reports are charged per item, per record listed.

Per Search Term Charges

This is a new approach introduced by database producers. This option is not yet available to users. Use of search terms as a charge base has many implications for vendors and users. Searchers always attempt to minimize on-line search costs. To minimize costs which are based on the number of keywords used to conduct the search has different implications than minimizing costs based on the amount of time the user is actually on line and the number of items retrieved.

Flat Rates

This can be set up as a monthly minimum fee to be paid, regardless of whether searches are actually performed.

Annual "Password" Fees

"Password" fees are designed to cover the cost of maintaining the account and costs involved in the billing process. Fees are usually between \$25.00 and \$100.00 per year.

Deposit Account Charges

A deposit account (or pre-paid account) often offers discounts, usually "stepped" according to the amount of the deposit. Sometimes fees, other than connect time charges, are deducted from the deposit account.

Credits

Some systems issue credits for certain transactions on the system. An example is OCLC, an interlibrary loan system. A fee is incurred for use of a record. A credit equal to the fee incurred for such a use is given for input of a catalog record not already in the system or for lending an item.

5.6.2 Alternate Distribution Media

CD-ROM Products

Products associated with on-line search services are usually licensed on an annual basis with updates on a quarterly basis. Annual subscription fees cover updates to the search software necessary to access the information on the CD. Discs with older information on them are sometimes made available for purchase. Prices vary widely in products marketed to the general public or to libraries. These prices range from \$300.00 for an outright purchase to \$18,000.00 for a yearly licensing fee.

Floppy Disk Products

Floppy disks are produced on a one time basis and are not normally updated. The distribution is usually an ASCII file to be used with a word processor and generally sells for less than \$100.00.

Magnetic Tape

As with floppy disk products, magnetic tape products are usually produced on a one time basis and are not normally updated. Formats available generally include Unix TAR and ANSI labeled, in densities ranging from 800 bpi to 6250 bpi. Comparable services include: ASR (Ada Software Repository) ANSI labeled duplications for \$200 (user supplied tapes); COSMIC software duplications, where prices range from \$50 to \$10,000 per individual software system (tapes and documentation supplied).

Printed Media

Printed media include directories of available software and services, news and information newsletters and full text information. COSMIC's charges for its software directory runs from \$25.00 for printed media to \$50.00 for magnetic tape version of that directory.

5.6.3 Workshops, Seminars and Consultants

Costs for technical workshops and seminars can range from free to \$4,000 per day plus cost of course materials and travel expenses for the instructor. Technical workshops are usually limited in size (15 to 20) people. Business oriented courses are normally unlimited in size and can cost \$4,000 depending on the nature of the lecture. Seminars open to the public are generally on a per person cost scale and range from \$1,200 to \$1,500. Consultant fees can be as much as \$500.00 per hour for highly technical information.

Chapter 6

Organizational Documents

Summary

This document contains draft copies of the organizational documents that are either currently in use by MountainNet to support development of AdaNET, or that will become necessary in the near future as the AdaNET facility makes its initial services offerings available commercially. Documents in this draft include:

Disclosure Agreement (long form) Draft agreement defining terms of non-disclosure of proprietary materials, or knowledge obtained through employment at MountainNet. Recommended for use with programmers and similar employees.

Full-Time Employment Agreement Draft of general form employment contract.

MountainNet Software License Draft software license for MountainNet software to be distributed to others.

Database Agreement Draft agreement for subscription access to on-line "database" materials.

Subcontract between MountainNet and Second Party General form of subcontract for work pursuant to MountainNet /NASA/University of Houston-Clear Lake project.

Teaming Agreement General form of agreement in principle to work with a second party on various specified projects, tasks or other activities.

AdaNET Electronic Mail Service Registration General form used for registration to on-line electronic mail and document transfer services.

Miscellaneous Documents General draft documents used internally for purchase and travel requests, to be included as part of the AdaNET operational policies and guidelines.

NONDISCLOSURE AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 19____, by and between MountainNet, Inc., (hereinafter "Company"), a corporation duly organized and existing under the laws of the State of West Virginia, and _____ (hereinafter "Recipient"), a corporation duly organized and existing under the laws of the State of _____:

In consideration of \$ 10.00, receipt of which is acknowledged by Recipient, and other good and adequate consideration, including the undertaking by the parties of the obligations herein, the parties hereto, intending to be legally bound, do hereby covenant and agree as follows:

Section 1

PURPOSE OF AGREEMENT

- 1.1 This Agreement is entered into for the sole purpose of authorizing Recipient to receive from Company certain proprietary computer software and related end-user documentation (if any) (collectively referred to as the Program) which is more specifically described as Exhibit A hereto, which is incorporated herein by this reference.

Section 2

GRANT OF LIMITED LICENSE

- 2.1 Recipient is granted a personal, non-exclusive license to install the Program on its [designate computer by make, model, and serial number] (the "Designated Computer") and to use the Program during the term of this Agreement only for the purpose of evaluating the performance of the Program in order to determine whether Recipient wishes to enter into the Company Program End- User License Agreement, a copy of which is included as Exhibit B hereto, which is incorporated herein by this reference.

Section 3

ACKNOWLEDGMENT OF TITLE

- 3.1 Recipient acknowledges that all right, title, and interest in and to the Program shall remain with Company. Nothing herein shall be deemed to convey or transfer any such right, title, and interest to Recipient. Recipient acknowledges that this Agreement shall convey to Recipient only a limited license as set forth in Section 2.1 hereof, not coupled with an interest, and revocable in accordance with the terms of this Agreement.

Section 4

ACKNOWLEDGMENT OF PROPRIETARY INFORMATION; LIMITATION ON USE THEREOF

- 4.1 Recipient acknowledges that the Program embodies valuable confidential and secret information (collectively referred to as Proprietary Information) of Company, which is entrusted to Recipient only for the purposes expressly set forth herein. Except as expressly authorized herein, Recipient shall not use or store the Program; download the Program in a retrieval system or computer of any kind; or copy, transfer, disclose, or permit access to the Program or any portion thereof to any other person. In no event shall Recipient attempt to decompile or reverse engineer the object code portion of Program into source code (human-readable) form. The provisions of this Section 4.1 shall survive termination of this Agreement and shall continue for so long as Recipient continues to possess or have access to the Proprietary Information. The confidentiality obligations set forth herein shall not apply to such of the Proprietary Information as may become part of the public domain.

Section 5

RIGHTS TO INJUNCTIVE RELIEF

- 5.1 Recognizing and acknowledging that any use or disclosure of its Proprietary Information by Recipient or any employee or agent of Recipient in a manner inconsistent with the provisions of this Agreement may cause Company

irreparable damage for which other remedies may be inadequate, Recipient agrees that Company shall have the right to petition for injunctive or other equitable relief from a court of competent jurisdiction as may be necessary and appropriate to prevent any unauthorized use or disclosure of any such information by Recipient, its employees, or its agents, and that, in connection therewith, Recipient shall not oppose such injunction on the grounds that an adequate remedy is available at law. Such remedy shall be in addition to other remedies available to Company.

Section 6

TERM OF AGREEMENT; TERMINATION

- 6.1 This Agreement shall continue from the date set forth above until the earlier of (1) execution by Recipient and Company of the Program End-User License Agreement designated as Exhibit B, (2) 30 days from the date hereof, or (3) two days' written notice of termination by Company for any reason. Upon termination of this Agreement pursuant to (2) or (3) above, Recipient shall immediately return to Company the Program and all Proprietary Information of Company, however embodied. Recipient shall thereupon certify to Company that it has not retained any copies or portion of the Program or any Proprietary Information of Company.

Section 7

DISCLAIMER OF WARRANTY; LIMITATION ON LIABILITY

- 7.1 COMPANY DISCLAIMS ANY AND ALL WARRANTIES RESPECTING THE PROGRAM AND USE THEREOF, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. In no event shall Company be liable for any indirect, exemplary, incidental, or consequential damage arising out of or otherwise relating to the use or performance of the Program, however caused, even if Company has been advised of the possibility or likelihood of such damages.

Section 8

MISCELLANEOUS

- 8.1 INDEPENDENT CONTRACTORS.** The parties hereto are independent contractors, and nothing herein shall be construed as creating any agency, joint venture, partnership, or other form of business association between the parties.
- 8.2 GOVERNING LAW.** This Agreement shall be construed and governed in all respects in accordance with the laws of the State of West Virginia.
- 8.3 NOTICES.** Any communication, transmittals, correspondence, or notice shall be in writing, postage prepaid, to the authorized representative of each party at the address set forth below.
- 8.4 SEVERABILITY.** In the event that one or more terms of this Agreement are determined by a court of competent jurisdiction to be void or unenforceable, such determination shall not affect the remaining terms hereof.
- 8.5 BINDING NATURE OF AGREEMENT; NO ASSIGNMENT.** This Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors. No assignment of this Agreement or the rights and obligations herein undertaken shall be made by either party without the prior written consent of the other. No amendment to this Agreement shall be binding upon the parties unless it is in writing and is executed by each of the parties hereto.
- 8.6 ENTIRE AGREEMENT.** This Agreement constitutes the entire scope of agreement between the parties respecting the subject matter hereof and supersedes all prior correspondence, proposals, understandings, representations, and communications.

WHEREBY, the parties have caused this Agreement to be executed by their duly authorized representatives as set forth below.

COMPANY
BY:

Name

Title

Address

Address

RECIPIENT
BY:

Name

Title

Address

Address

FULL TIME EMPLOYMENT AGREEMENT

This agreement, entered into this _____ day of _____, 19____, between MountainNet Corporation and _____, is for such services as shall be requested by MountainNet Corporation on a full time basis.

In consideration of mutual exchange of promises contained herein, the Employee agrees to provide services to MountainNet Corporation and MountainNet Corporation agrees to accept such services and pay employee as follows:

Monthly rate is \$_____. Hourly rate is _____. (what-ever applies).

This contract will commence on the date of signature and shall remain in full force for one year.

Employee agrees to keep company materials confidential and to return all such materials to MountainNet Corporation when Employee's need therefore has ended, or Employee's employment has terminated, whichever first occurs. If unable to return such material, employee must destroy any such material in his possession so as not to disclose any information or portion thereof to anyone not a party to this agreement. Employee agrees to keep ALL company business confidential. Failure to keep company information confidential may result in immediate termination of employment.

Unless otherwise agreed in writing, Employee releases, assigns, conveys, transfers and gives up in favor of MountainNet any right to materials developed for MountainNet Corporation or its clients, or developed with materials or information which was or reasonably could have been obtained through employment hereunder.

Employee agrees to disclose immediately and in writing to the president of MountainNet any inventions conceived or first actually reduced to practice in the performance of work under this agreement. The disclosure intended under this provision shall be made in sufficient time to permit the filing of patent applications prior to U.S. or foreign statutory bars.

Upon completion of 90 days of satisfactory employment, Employee will be permitted to participate in such health and/or life insurance benefits as may from time-to-time be offered by the company.

Employee understands that he will be periodically evaluated as to the quality and quantity of his work, with a major review after not more than 90 days of employment. If work is available and performance is satisfactory, employee will continue with MountainNet Corporation under this agreement. If performance as determined in MountainNet's sole and exclusive determination is unsatisfactory, employment may be terminated immediately. In the event that contracts with clients being served by employee expire or are otherwise terminated, MountainNet Corporation has the right to terminate or reduce Employee's employment and agrees to provide notice of such anticipated termination or reduction to the Employee as far in advance thereof as is reasonably possible under the circumstances.

In the event that any term or condition of this agreement is for any reason determined to be void or enforce, for any reason, the void or unenforceable term shall be stricken and the remainder shall remain in full force and effect.

Failure by either party to enforce any term of this agreement shall not be considered to be a continuing waiver of such term, and the same may be enforced or applied at any time thereafter.

This document constitutes the full and complete agreement between the parties.

I acknowledge that I have read this agreement, have had and taken advantage of an opportunity to ask questions concerning it, understand it and agree with the terms and conditions contained within the document.

MountainNet Corporation:

Employee:

President

MOUNTAINNET SOFTWARE LICENSE TERMS AND CONDITIONS

This license agreement made on the date indicated below is by and between MountainNet, Inc. ("MountainNet"), a corporation, doing business at Dellslow, West Virginia, U.S.A., and _____, (Licensee).

MountainNet agrees to grant, and the Licensee agrees to accept, a non-exclusive License to use the "Software" attached as Exhibit A, including any subsequent updates according to the following terms and conditions:

OWNERSHIP OF SOFTWARE

The Software is licensed for use on a single non-clustered VAX computer system located at the address indicated in this agreement. Licensee acknowledges that by virtue of this agreement, Licensee acquires only the right to use the Software while this agreement is in effect and does not acquire any title to, or ownership of, the Software listed in Exhibit A. Ownership of all Exhibit A Software remains with MountainNet.

TRANSFER

In the event of a transfer of the MountainNet license and Software to an alternate Central Processing Unit ("CPU"), notification must be given in writing to MOUNTAINNET within 30 days and must be accompanied by the Transfer of MOUNTAINNET Software License agreement. Transfer of the license terminates the right to use the Software on the original CPU. Additional costs may be incurred depending on the new CPU model.

MULTIPLE LICENSE AGREEMENT

After purchasing one Software license, Licensee can purchase each additional Software License for the then prevailing price.

NON-DISCLOSURE BY LICENSEE

Software licensed under this agreement is the proprietary property of MountainNet. This Software is distributed for use on a single computer system, and may not be copied except for use on the designated system and must always include the Copyright notice of MountainNet and all features which disclose the Software name and licensed site. MountainNet Software and/or documentation cannot be copied except for the internal use by the licensed MountainNet installation. MountainNet Software and/or documentation cannot be shared, sold, or otherwise dispersed without the written permission of MountainNet.

Licensee agrees to take appropriate action by instruction, agreement, or notice to its employees, agents or other persons permitted access to MountainNet Software in order to satisfy Licensee's obligations under this agreement with respect to use, copying, and maintaining the proprietary nature of MountainNet Software.

Licensee agrees not to provide or otherwise make available any program in any form or media, to any individual or corporation or entity without express permission in writing from MountainNet. This written authorization must be signed by one of MountainNet's corporate officers. Licensee nor his representatives will divulge any information with respect to the technology embodied within MountainNet Software. Licensee is further required to obtain a signed non-disclosure agreement from any outside agency before allowing that agency to view or in any manner access MountainNet programs, documentation, or source code. One signed copy of the non-disclosure agreement must be provided to MountainNet. If Licensee or any of its employees, agents or representatives shall attempt to use or dispose of the Software or any of its aspects or components or any duplication thereof in a manner contrary to the terms of this agreement, MountainNet shall have the right, in addition to such other remedies which may be available to MountainNet by law, to injunctive relief against such acts or attempts.

Only licensed MountainNet sites are authorized to possess or use any MountainNet Software, including any Software or applications based upon MountainNet code or building blocks. Licensee can share Software applications with other licensed MountainNet sites through the MountainNet users Group, provided the applications do not compete with applications which are being developed or sold by MountainNet.

PAYMENT TERMS

Payment for the Software shall be due according to the terms specified in Exhibit A. If payment is not received within the stated period at MountainNet's place of business, MountainNet shall have the right to terminate Licensee's usage of Software and Licensee hereby waives any rights to continued usage of Software if these payment terms are not met. MountainNet shall be held harmless for any claim whatsoever arising out of the termination of usage of Software by Licensee due to nonpayment.

All applicable taxes shall be paid by Licensee. The unpaid balance of each module of Software is to be paid for upon installation at Licensee's site.

Listed prices refer to single standard MountainNet modules. If two or more versions of any application must be developed by MountainNet the Licensee will be charged for each. The Licensee can contract with MountainNet for additional programming or systems assistance, if desired. Charges for modification or assistance will be at the standard prevailing rate. MountainNet will be held harmless if modifications requested by Licensee result in the elimination of any features or safeguards normally provided by the Software.

INSTALLATION AND SCHEDULING

Software installation can normally begin within 30 days after the computer is installed. Within practical limits, the priority of modules contracted for and the order of installation can be determined by the Licensee. MountainNet will attempt to complete installation of each module within a time frame to accommodate the Licensee's needs; however, completion according to specific deadlines cannot be guaranteed. Some of the standard Software modules include a specific number of user defined parameters. Before work can begin, MountainNet must have a clear understanding of the Licensee's requirements and of all factors which affect the implementation of the module. Completed parameter packages and other requested information must be given full consideration, but no obligation is assumed by MountainNet to fulfill all requests. MountainNet will determine whether Licensee requests can be implemented, and if said implementation would result in additional costs. MountainNet will proceed with additional chargeable services only if authorized by Licensee. After providing MountainNet with the requested information, no changes should be made in these items without immediately contacting MountainNet. Changes in the original requirements, data files, or any other changes causing extra effort by MountainNet may delay installation and result in additional charges.

If the Fiscal Reporting module is ordered, the Licensee staff member most knowledgeable in financial reporting requirements and the person who will be

responsible for data processing should plan a trip to the MountainNet offices to assist in defining the details of the Fiscal Reporting System. Licensee is responsible for travel and per diem expenses. There is, however, no additional charge by MountainNet for this service.

MountainNet shall be held harmless from any claim whatsoever caused by the act, omissions, conduct, or negligence of the Licensee, its agents, representatives, or employees. Licensee will be responsible for additional expenses incurred by MountainNet if MountainNet is prevented from fulfilling commitments because of any act, conduct, omission, or negligence of the Licensee, its agents, representatives, or employees. Such negligence includes, but is not limited to, the failure to advise MountainNet in advance of any known problems which might interfere with performance of duties, the absence of staff members necessary for consultation and decision making, and the lack of necessary facilities and properly functioning equipment. Maintenance and repairs must not be scheduled for the time that MountainNet staff members are on-site. Licensee negligence also includes diversion of MountainNet personnel from scheduled tasks to non-scheduled projects or anything contrary to the declared purpose of the on-site visit. Additional expenses for which Licensee can be charged include, but are not limited to, any extra travel, per diem, and labor costs incurred in the fulfillment of implementation.

DELAY

Postponement or delay of installation which is not caused by MountainNet may, at MountainNet's option, result in price increases. Prices are based on costs and conditions existing on date of quotation and are subject to change if implementation cannot be performed within a reasonable time.

CONVERSION

Some utility programs for data conversion are provided with the understanding that MountainNet assumes no responsibility for their support. During DMS initial installation, MountainNet personnel will provide Licensee's staff members with a maximum of four hours assistance in the use of the utilities. Additional hours of assistance will be chargeable at the then prevailing rate. MountainNet will not be responsible for conversion unless explicitly agreed to in writing.

INTERFACING

MountainNet will not be responsible for interfacing MountainNet system to other systems, unless explicitly agreed to in writing.

TRAINING

On-site training is provided during installation for each module based on the terms specified in Exhibit A. It is important that those who will be directly involved in the use of the Software attend these classes. This training is included in the price of the Software. Licensee's staff who will be involved in the use of the Software must become knowledgeable in the use of the Data Management System and the application areas for which they will become responsible in order to perform the process necessary for file maintenance and reporting. It is imperative that key people be available during installation and training.

DOCUMENTATION

MountainNet will provide one printed copy of documentation with each software module purchased. The Licensee has the option to purchase additional copies from MountainNet or licensee may reproduce the documentation for internal use only. Orders to MountainNet for documentation for obsolete software versions may not be available.

Documentation for most special application systems must, by the nature of the Software, be generated on the Licensee's site as the systems are implemented.

AVAILABILITY OF SOURCE CODE

Licensee may acquire the right-to-use source code based on the then prevailing pricing. Once the right-to-use source code has been acquired, Licensee is prohibited from allowing source code to be used on any CPU which is not covered by this License.

SOFTWARE WARRANTY AND LIMITATION OF LIABILITIES

MountainNet warrants to the Licensee that the Software will conform to the Software product descriptions provided to Licensee. MountainNet's obligation under this agreement, however, is limited to providing corrected Software which conforms to the Software product descriptions. No representation or other affirmation or warranty is made concerning the capacity, suitability, or performance of the computer Software. MountainNet further makes no representations as to the

compatibility of MountainNet Software with the equipment, operating systems, or Software currently in use or contemplated by Licensee unless stated herein.

Except as specifically provided in this Agreement, there are no other warranties, express or implied, including but not limited to any implied warranties of merchantability or fitness of Software. MountainNet shall in no event be liable for damages, including but not limited to loss of profits or other economic loss, direct, indirect, special, consequential, or other damages, including but not limited to those arising out of any breach of this agreement or obligations hereunder. There are no warranties which extend beyond the description on the face of this agreement.

This warranty does not apply and will be considered null and void if the Software is used or operated in a manner or in an environment not consistent with its intended purpose or is modified or repaired in any manner which adversely affects its operation or reliability. Software designed for different computers and operating systems is not identical. MountainNet shall assume no liability or offer any warranty regarding Software operated on equipment or operating system other than that for which it was designed.

Each module of MountainNet Software is warranted in accordance with the terms of this agreement for a period of ninety days following installation. Qualified professional help is readily available by telephone. The Licensee's system may be dialed up from the MountainNet offices providing that dial-up facilities exist at Licensee's site. MountainNet reserves the right to make the decision on the best means of Software correction, and assumes no responsibility for maintenance of programs which have been modified by other than MountainNet personnel.

Successful implementation depends upon mutual effort and involvement, and requires a positive attitude toward the MountainNet user-oriented philosophy. If Licensee's staff is not receptive toward the utilization of the user-oriented Software or any vendor-supplied Software, the chance for success is greatly diminished. Thorough testing of each module is the responsibility of the Licensee, and should begin immediately upon installation. Licensee must maintain an adequate and properly trained staff of resource people to assist other users. These resource people should serve as the focal point with MountainNet in order to eliminate unnecessary or repetitious phone calls.

Upon request, MountainNet may, at its discretion, choose to provide assistance beyond the obligations of this agreement, with the understanding that MountainNet may in no way be held responsible for any problems which might result, and such action does not imply any obligation to continue such assistance. If MountainNet deems Licensee's questions or requests to be unreasonable or too

time consuming, MountainNet can upon notification charge Licensee for future assistance.

SUBSCRIPTION SERVICE

After the ninety day warranty, telephone support and enhancements for the Software will be provided for an annual subscription fee. Subscription service is integral to the grant of this license, and payment of the annual subscription service fee entitles Licensee to continued use of the Software. Licensee will be billed for Subscription Service based on a percentage of the then current list price of the Software for the period from each July 1 to June 30 of the following year. To keep billing on a regular cycle, Licensee will be billed for the months between expiration of the ninety day warranty and the following June 30 on a pro-rated basis.

Subscription Service updates will be made available periodically. MountainNet will determine the enhancements to be added to the Software, based upon the requests and suggestions of subscribers. Patches and new releases of Software are provided on magnetic tape or on hard copy, depending upon volume. Licensee is responsible for implementing patches. All mandatory patches must be installed to insure proper program performance and continued support. Failure may result in time and materials billing at current applicable rate. MountainNet makes no representation that future Software updates will be usable on Licensee's system, and assumes no responsibility for problems caused by replacing existing Software with updates. Licensee assumes full responsibility for any problems which may result from the installation of updates, and should exercise extreme caution in replacing Software which has been modified or tailored to suit specific needs.

The MountainNet Product Center reserves the right not to release enhancements to DMS and application software during the term of the annual renewal of subscription service. Failure to release enhancements to DMS and application software during the term of the renewal does not constitute default on the part of the MountainNet Product Center because of the continuation of telephone support and other support-related services.

If MountainNet determines that a Subscription Service update requires additional or revised documentation, one copy of such documentation will be provided to the Licensee. At the option of MountainNet this documentation may take the form of new manuals, change pages to existing manuals, manual addendums, machine readable text, or any combination of these methods.

Maintenance of the Licensee's hardware, operating system, and environment is the responsibility of the Licensee, and not of MountainNet.

Licensee is responsible for maintaining adequate back-up procedures for safeguarding all data files, programs, and applications on Licensee's premises. MountainNet assumes no responsibility for providing replacement Software if any is lost or destroyed.

TITLES

The titles of the articles and sections of this agreement are for convenience only and are not a part of this agreement and do not in any way limit or amplify the terms and provisions of this agreement.

ASSIGNMENTS

The parties hereto agree that no sublicensing, nor assignments of rights or interest, nor delegation of duties under this agreement shall be made or become effective without the prior written consent of both MountainNet and Licensee. This prohibition of sublicensing, assignment and delegation extends to all sublicensing, assignments and delegations that may be lawfully prohibited by this agreement. Any attempted sublicensing, assignment or delegation without prior written consent shall be wholly void and ineffective for all purposes.

CHOICE OF LAW

The parties hereto agree that the laws of the State of West Virginia shall govern this agreement and any question arising hereunder shall be constructed according to such laws. No action arising out of any claim, breach of this agreement, or obligations under this agreement may be brought by Licensee more than one year after the cause of action has occurred. All such actions may only be brought in the State of West Virginia.

LIMITATION OF CLAIMS

Should MountainNet's responsibilities under this agreement be breached or should MountainNet in some manner be negligent, regardless of the form or theory of any legal or equitable action brought against MountainNet by Licensee, Licensee's sole remedy and recovery shall be limited to the price of the allegedly defective or inadequate program involved, and that Licensee's sole and exclusive remedy against MountainNet shall be for MountainNet to repair or replace said defective or inadequate program.

SAVING CLAUSE

All quotations and agreements are contingent upon accidents, fires, availability of materials and all other causes beyond the control of either party. Typographical and stenographic errors are subject to correction. Terms inconsistent with those stated herein, which might appear on the Licensee's formal order or Request for Proposal, will not be binding on MountainNet.

INTEGRATION

This agreement contains the full agreement of the parties hereto. No commitment beyond those explicitly stated is implied or intended. No prior agreement or understanding pertaining to any matters discussed herein shall be effective. This agreement may not be changed orally, but only by an agreement in writing signed by a corporate officer of MountainNet and an authorized representative of Licensee. MountainNet may not be held responsible for any claim of verbal instructions or agreements.

INVALIDITY

If any of the provisions of this agreement shall be construed to be invalid under the laws of the State of New Mexico, such conditions shall not invalidate any other provisions of this agreement. The remaining valid provisions of this agreement shall continue in full effect and shall be binding on the parties hereto.

IN WITNESS WHEREOF, the parties hereto have executed this agreement
on the date written below.

Agreed to this ____ day of _____, 19__.

For MountainNet:

For Licensee:

DATABASE AGREEMENT

THIS AGREEMENT is made and entered into this _____ day of _____, 19____, by and between MountainNet, Inc., (hereinafter "Provider"), a corporation with an address for purposes of this Agreement at P.O. Box 370, Dellslow, West Virginia 26531-0370, and _____, (hereinafter "Subscriber") a _____ with an address for purposes of this Agreement at _____.

WITNESSETH:

WHEREAS, Provider maintains, sponsors and makes available compilations of programs, subroutines, information and materials through Provider's AdaNET computer-assisted information-retrieval services (the "Service") for access and use by customers of Provider, such as Subscriber; and

WHEREAS, Subscriber desires to obtain access to the Service and use it for its internal business purposes;

NOW, THEREFORE, IT IS AGREED:

Section 1

THE SERVICE; CHARGES

- 1.1 During the term of this Agreement, Provider shall provide Subscriber the Service, including the libraries set forth in Exhibit A, as supplemental and updated from time to time, in accordance with Provider's agreements with the organizations sponsoring the Service, and Subscriber will pay the charges calculated in accordance with Provider's standard rate schedule, the current version of which is set forth in Exhibit B hereto. Provider may change its standard rate schedule at any time, provided that Subscriber is given thirty (30) days' advance notice of such change before it becomes effective.
- 1.2 The charges set forth in this Agreement are exclusive of any state or local sales or use taxes, or taxes of a similar nature, which Subscriber shall pay either directly to the taxing authority or as reimbursement to Provider.

- 1.4 During the term of this Agreement, Provider will make the Service available to Subscriber during the days and hours specified in Exhibit —, which days and hours are subject to modification from time to time. Further, the Subscriber agrees and recognizes that interruptions to service may occur as a result of system maintenance and upgrading. The Provider agrees that routine maintenance and upgrading will when possible be scheduled to avoid business day service outages.

Section 2 BILLING AND PAYMENT PROCEDURES

- 2.1 Subscriber will authorize one or more individuals in its offices to use the Service and Provider will assign a personal billing number to each individual authorized by Subscriber to use the Service. Provider reserves the right to change any billing numbers from time to time. Each individual authorized by Subscriber to use the Service will specify his billing number each time the Service is used. Subject to Section 2.2 hereof, Subscriber will pay for all use of the Service ordered through the billing number assigned to an authorized individual in Subscriber's offices.
- 2.2 If Subscriber learns at any time that the billing number assigned to an individual in its offices pursuant to Section 2.1 hereof has been obtained by a person not authorized to use the Service on behalf of Subscriber or for its account, or if Subscriber otherwise suspects that any unauthorized use is being made of a billing number assigned to an individual in its offices, Subscriber will notify Provider immediately by telephone and confirm such notification in writing. Provider will then cancel such billing number and will assign a new billing number to the appropriate individual.
- 2.3 Each month, Provider will send to Subscriber an invoice for all charges incurred by Subscriber during the preceding month. Within — days after receiving each invoice, Subscriber will pay to Provider the full amount payable thereunder. If Subscriber does not make timely payment, Provider may terminate this Agreement, may cease to provide the Service to Subscriber until such time as Subscriber pays the full amount due to Provider, or may exercise any other remedies provided by law. In addition, Provider may charge Subscriber the lesser of — percent or the maximum legal interest on its unpaid balance.

Section 3
PROHIBITION ON THIRD-PARTY CHARGES

- 3.1 Except as a part of charges made for services rendered in the course of Subscriber's normal professional activities, Subscriber will not charge or receive compensation for use of the Service, for conducting research for others with the aid of the Service, or for instructing or assisting others in the use of the Service.

Section 4

- 4.1 Provider will make an appropriate adjustment to any amount paid or payable by Subscriber for any use of the Service involving faulty retrieval, failure of retrieval, or loss of research, except to the extent caused by improper use of the Service by Subscriber, but only if Subscriber promptly reports to Provider such faulty retrieval, failure of retrieval, or loss of research.
- 4.2 If in any given month the Service is unavailable to Subscriber for any reason within the control of Provider, for four or more consecutive hours during which the Service is scheduled to be available to Subscriber, then Subscriber's minimum monthly commitment in use charges in such month will be reduced by an amount computed by multiplying Subscriber's minimum monthly commitment in use charges for such month by a fraction, the numerator of which is determined by first computing the total number of hours that the Service is not available to Subscriber in all such periods of four or more consecutive hours during such month for each access terminal and then adding all such totals together, and the denominator of which is the total number of hours that the Service is scheduled to be available during such month multiplied by the number of access terminals installed in Subscriber's offices.
- 4.3 Subject to Section 4.6 hereof, Subscriber assumes sole responsibility for all use of the Service and hereby indemnifies and holds harmless Provider against any liability or claim of any person arising from such use, except when such liability or claim is the result of faulty retrieval, failure of retrieval, or loss of research not attributable to improper use of the Service by Subscriber.
- 4.4 No Provider personnel are authorized to assist Subscriber in framing a research request. If, notwithstanding this, Subscriber requests and receives

assistance from Provider personnel in framing a search request, such assistance will be at Subscriber's risk and Provider will not have any responsibility or liability arising therefrom. For purposes of this Agreement, "framing a search request" shall mean the process by which a user identifies the research problem; selects the words, phrases, or numbers to be used in the search; and determines the relationship to each other of such words, phrases, and numbers and the order in which they are to be submitted.

- 4.5 The obligations set forth in Sections 4.1 and 4.2 hereof are the full extent of the responsibility of Provider to Subscriber for faulty retrieval, failure of retrieval, or loss of research, and in no event will Provider be liable to Subscriber for consequential, exemplary, or special damages resulting in whole or in part from Subscriber's use of the Service.
- 4.6 Provider hereby indemnifies and holds harmless Subscriber from and against any and all claims of copyright or patent infringement arising out of Subscriber's use of the Service. Provider will have the right to assume the defense of any such claims, irrespective of the validity or merits of such claims, and Subscriber will assist Provider, as may reasonably be required, in such defense.
- 4.7 Provider warrants that, without the express consent of Subscriber, no Provider employee or agent will disclose to any third party any information regarding research performed through the use of the Service by any of Subscriber's authorized users.

Section 5 TERM

- 5.1 The term of this Agreement shall commence on the date of execution of this agreement and will continue in force until terminated by either party upon ___ months' written notice to the other party, provided, however, that it may not be terminated prior to ___ year(s) after the date on which the term first commenced.

Section 6 ASSIGNABILITY

- 6.1 This Agreement may not be assigned, in whole or in part, by Subscriber without the prior written approval of Provider, except that it may be assigned without such approval to any successor in interest of Subscriber.

Section 7

SOLE AGREEMENT

- 7.1** This Agreement contains the entire agreement of the parties and cannot be changed or modified except by a written instrument executed by a duly authorized representative of the party against whom enforcement of such charge of modification is sought.

Section 8

ENFORCEABILITY

- 8.1** If any part of this Agreement is held unenforceable, the rest of the Agreement will nevertheless remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals the date and year first hereinabove written.

MountainNet, Inc.
By: R. Michael Digman,
President

[Subscriber]

SUBCONTRACT
Between
MOUNTAINNET, INC.
and

THIS SUBCONTRACT is entered into by and between MountainNet, Inc. located in Dellslow, West Virginia, and _____, located in _____, (hereinafter referred to as "Subcontractor").

W I T N E S S E T H:

WHEREAS, The University of Houston, Clear Lake, and the National Aeronautics and Space Administration (NASA) (hereinafter referred to as "Government") have entered in Cooperative Agreement No. NCC9-16, which involves the project entitled Research Institute for Computing and Information Systems (RICIS); and;

WHEREAS, MountainNet, Inc. and the University of Houston, Clear Lake, (hereinafter referred to as "Houston") have entered in an agreement or subcontract which involves the project entitled Research Institute for Computing and Information Systems (RICIS); and

WHEREAS, Subcontractor has proposed to cooperate and assist MountainNet, Inc. in establishing the feasibility of expanding commercial utilization of Government Ada (R) Technology;

NOW, THEREFORE, the parties hereto do covenant and agree as follows:

ARTICLE I:

SCOPE OF WORK

Subcontractor agrees to perform the work set forth in the Scope of Work appended hereto and incorporated as Appendix A. The Scope of Work shall not be changed except by duly executed amendment to this Subcontract.

ARTICLE II:

PERIOD OF PERFORMANCE

The initial period of performance for this Subcontract shall commence on _____ and shall terminate on _____ unless extended by mutual agreement in writing between the parties or unless terminated by MountainNet, Inc. as provided in Article XIV. It is understood that the parties intend to extend performance subject to further funding availability.

ARTICLE III:

PROJECT DIRECTION

- (a) Subcontractor's performance of the work shall be under the technical direction of James Rautner who is hereby named MountainNet, Inc.'s Technical Representative in the monitoring of this project. This Technical Representative is authorized to exercise the technical direction of this project only within the general scope of work.
- (b) All matters affecting the terms of this subcontract or the administration thereof shall be referred to Michael Digman, who is hereby named Contract Administrator. Prior written approval from Contract Administrator shall be required for any changes or amendments to this subcontract, including but not limited to, changes in the scope of work, period of performance, cost, and report requirements.

ARTICLE IV:

CONSIDERATION AND PAYMENT

- (a) As consideration and compensation for the work cited in Appendix A, MountainNet, Inc. agrees to pay Subcontractor its costs in the amount not to exceed \$_____. All costs shall be in accordance with the cost principles set forth in the Federal Acquisition Regulation Part 31 and the NASA FAR Supplement Part 18-31 which are hereby incorporated by reference and are made a part of this subcontract with the same force and effect as if set forth in full text.
- (b) Invoices for expenses incurred shall be submitted in triplicate, monthly, to the following address:

MountainNet, Inc.
Attention: Michael Digman
PO Box 370
Dellslow, WV 26531

- (c) Payment of said invoices shall be contingent upon approval by MountainNet, Inc.'s Technical Representative. Said invoices shall be in accordance with the billing format appended hereto and incorporated as Appendix B.
- (d) A maximum of ten percent (10%) of the costs billed by the Subcontractor to this subcontract shall be withheld and retained until the final requirements have been completed by Subcontractor and approved by MountainNet, Inc.'s Technical Representative.

ARTICLE V:

KEY PERSONNEL

The individuals set forth in Appendix C are considered essential to the work being performed under this agreement; substitutions for any such individuals or substantial reductions in any of the efforts require MountainNet, Inc. approval. A change in key personnel by the Subcontractor without the approval of MountainNet, Inc. shall be justification for termination of this subcontract in accordance with Article XIV, Termination.

ARTICLE VI:

TRAVEL

- (a) Prior authorization for travel must be obtained from MountainNet, Inc.'s Technical Representative. All travel reimbursable hereunder shall be via economy class rates when available. If not available, reimbursement vouchers will be annotated that economy class accommodations were not available.
- (b) All foreign travel must be clearly essential to the research effort and must, to be charged to this subcontract, have the prior approval of MountainNet, Inc. for each specific trip regardless of its inclusion in a proposal budget. Approvals will be made in accordance with the policies and procedures set forth in paragraph 516 of the NASA Grant and Cooperative Agreement Handbook.

- (c) All other travel costs shall be reimbursable in accordance with the Federal Travel Regulation which is incorporated by reference and is made part of this subcontract with the same force and effect as if set forth in full text.

ARTICLE VII:

DELIVERABLES

Subcontractor shall submit the reports/deliverables described in Appendix A and in accordance with the time frames specified in Appendix A. It is understood that the schedule of deliveries provides for maximum times and that earlier delivery is encouraged.

ARTICLE VIII:

INSPECTION AND ACCEPTANCE

Inspection and acceptance of the required deliverables referenced in Article VII under this subcontract will be accomplished by MountainNet, Inc.'s Technical Representative. Shipment of all deliverables shall be made to:

MountainNet, Inc.
Attention: Michael Digman
PO Box 370
Dellslow, WV 26531

ARTICLE IX:

PUBLICATIONS

- (a) All measurement values employed in technical reports prepared under this cooperative agreement shall be expressed in the International System of Units (SI). Expression in both SI units and customary units is acceptable where the use of SI units alone would obviously impair communications or reduce the usefulness of the report to the primary recipients. When both systems of units are used, SI units are to be stated first and customary units afterwards in parentheses. In each case, the report shall state which system of units was used for the principal measurements and calculations.
- (b) Draft and final technical reports shall have a title page that displays the title of the cooperative agreement and this subcontract, the type of report,

the name of the Principal Investigator, the period covered by the report, the name and address of the Subcontractor, and the cooperative agreement and subcontract number.

- (c) Twelve (12) copies of all draft reports and final reports shall be submitted to MountainNet, Inc.
- (d) In the event any draft, interim, or final technical report submitted to MountainNet, Inc. contains information describing a "Subject Invention" for which the Subcontractor has elected or may elect title, MountainNet, Inc. will use reasonable efforts to delay public release or publication until six months from the date of receipt in order for a patent application to be filed provided the Subcontractor identifies the information and the "Subject Invention" to which it relates at the time of submittal.

ARTICLE X:

CONFIDENTIALITY

- (a) Each party shall use its best efforts to maintain in strict confidence and shall not disclose or permit others to disclose the content of any and all confidential materials of any kind or nature which are provided by the other party and are marked as such.
- (b) Except with regard to participation in this subcontract, neither party shall use or permit others to use the name of the other party, or any part or branch thereof in any manner whatsoever without obtaining the express prior written consent of such other party.

ARTICLE XI:

NOTICES

All notices or communications to either party by the other shall be delivered personally or sent by U.S. mail, postage prepaid, addressed to such party at the following respective addresses for each and shall be deemed given on the date so delivered or so deposited in the mail unless otherwise provided herein.

MountainNet, Inc.
Attention: Michael Digman
PO Box 370
Dellslow, WV 26531

ARTICLE XII:

INDEPENDENT CONTRACTOR

Subcontractor herein is an independent contractor, not a partner or joint venturer, and shall not act as an agent for MountainNet, Inc. Nor shall Subcontractor be deemed to be an employee of MountainNet, Inc. for any purposes whatsoever. Subcontractor shall not have any authority, either express or implied, to enter any agreement, incur any obligations on MountainNet, Inc.'s behalf, or commit MountainNet, Inc. in any manner whatsoever without MountainNet, Inc.'s express prior written consent.

ARTICLE XIII:

LIABILITY

Subcontractor agrees to defend, indemnify, and hold harmless MountainNet, Inc. from any and all claims, injuries, damages or other liability arising in tort or breach of contract and resulting directly or indirectly from any intentional or negligent (including grossly negligent) acts or failure to act by Subcontractor's principals, officers, agents, or employees arising in favor of any person or entity.

ARTICLE XIV:

TERMINATION

In the event of default by Subcontractor of the obligations under this subcontract or in the event that Houston terminates work by MountainNet, Inc. on this subject matter, then performance by Subcontractor maybe terminated by MountainNet, Inc. at any time by giving written notice. Such notice shall be effective upon the receipt of written notice by Subcontractor.

ARTICLE XV:

CIVIL RIGHTS

This subcontract is subject to the provisions of Title VI of the Civil Right Act of 1964 (Public Law 83-352; 42 U.S.C. 200d- 1), Title IX of the Education Amendments of 1972 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), the Age Discrimination Act of 1975 (42 U.S.C. 6101, et seq.), and the NASA implementing regulations (14 CFR 1250).

ARTICLE XVI:

SAFETY

- (a) The Subcontractor shall act responsibly in matters of safety and shall take all reasonable safety measures in performing under this subcontract. The Subcontractor shall comply with all applicable federal, state, and local laws relating to safety. The Subcontractor shall maintain a record of and will notify MountainNet, Inc. of any hazards that come to its attention as a result of the work under the subcontract through routine reports furnished in compliance with this subcontract.
- (b) Where the work under this subcontract involves flight hardware, the hazardous aspects, if any, of such hardware will be identified, in writing, by the Subcontractor. Compliance with the provisions of this clause by lower tier subcontractors will be the responsibility of Subcontractor.

**ARTICLE XVII:
SUBCONTRACTS**

- (a) Approval of subcontracts for the purchase of property or equipment under this subcontract shall be obtained in accordance with the provisions herein entitled "Equipment and Other Property." All other subcontracts not provided for in Appendix D (if any) require the prior consent of MountainNet, Inc.
- (b) In accordance with the Small Business Act Amendments, Public Law 95-507, small and disadvantaged firms shall be utilized as subcontractors to Subcontractor to the maximum extent.

**ARTICLE XVIII:
EQUIPMENT AND OTHER PROPERTY**

- (a) Acquisition of property costing in excess of \$1,000, the cost of which will be charged to this subcontract, except as identified in Appendix A hereto, requires the prior approval of MountainNet, Inc.
- (b) MountainNet, Inc. funds shall not be used to purchase items such as furniture, furnishings, office equipment or other items of a nontechnical nature without the prior written permission of MountainNet, Inc. Under no circumstances shall MountainNet, Inc. funds be used to acquire land or any interest therein, to acquire or construct facilities or to procure passenger carrying vehicles.
- (c) Title to equipment purchased with MountainNet, Inc. funds vest in MountainNet, Inc. unless otherwise provided. MountainNet, Inc., reserves the right to require transfer to the United States Government of title to items purchased at a cost of \$1,000 or more. Such reservation is subject to the conditions of Paragraph 505 of the NASA Grant and Cooperative Agreement Handbook.
- (d) Title to Government property (including equipment, title to which has been transferred to the Government pursuant to subparagraph (c) prior to completion of the work) will remain with the Government.
- (e) Title to expendable property shall vest in the recipient upon acquisition.

- (f) The Subcontractor shall maintain property records and otherwise manage nonexpendable personal property utilized in the performance of this subcontract in accordance with the provisions of paragraph 509 of the NASA Grant and Cooperative Agreement Handbook. The Subcontractor will submit annually an inventory listing of Government owned property held in contemplation of use under this agreement and in its custody to MountainNet, Inc. Such listings will be as of June 30, will be submitted by July 15, and will reflect the record elements required in paragraph 509(b)(1) and beginning and ending dollar value totals for the period. Upon completion of the subcontract or when the property is no longer needed, the recipient shall notify MountainNet, Inc. who will obtain disposition instructions from the NASA Grants Officer, through UHCL.

ARTICLE XIX:

COMMUNICATIONS

The Research Coordinator may expect to be contacted by NASA and University of Houston, Clear Lake, personnel and MountainNet, Inc.'s Technical Representative named herein in connection with the technical aspects of the work under the subcontract. However, written or oral communications of an administrative nature, such as approval of foreign travel, property matters, patent matters, extension of the terms of the subcontract, etc., shall be channeled through the Subcontractor's business office to the Contract Administrator unless otherwise specified by the Contract Administrator.

ARTICLE XXI:

CLEAN AIR-WATER POLLUTION

If this subcontract is in excess of \$100,000, the Subcontractor agrees to notify the Contract Administrator promptly of the receipt, whether prior or subsequent to the Subcontractor's acceptance of this subcontract, of any communication from the Director, Office of Federal Activities, Environmental Protection Agency (EPA), indicating that a facility to be utilized under or in performance of this subcontract or any lower tier subcontract hereunder is under consideration to be listed on the EPA "List of Violating Facilities" published pursuant to 40 CFR 15.20. By acceptance of a subcontract in excess of \$100,000, the Subcontractor (i) stipulates that any facility to be utilized thereunder is not listed on the EPA "List of Violating Facilities" as of the date of acceptance; (ii) agrees to comply with all

requirements of Section 114 of the Clean Air Act as amended (42 U.S.C. 1857, et seq., as amended by Public Law 91-604) and Section 308 of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251, et seq., as amended by Public Law 92-500) relating to inspection, monitoring, entry, report and information, and all other requirements specified in the aforementioned sections, as well as all regulations and guidelines issued thereunder after award of and applicable to this subcontract; and (iii) agrees to include the criteria and requirements of this clause in every subcontract hereunder in excess of \$100,000, and to take such action as the Contract Administrator may direct to enforce such criteria and requirements.

ARTICLE XXII:

PROCUREMENT STANDARDS

The Subcontractor's procurement practices shall meet the standards set forth in paragraph 512 of the NASA Grant and Cooperative Agreement Handbook.

ARTICLE XXIII:

RIGHTS IN DATA

(A) Definitions

"Data", as used in this clause, means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as contract cost analyses or financial, business, and management information required for contract administration purposes.

"Technical data", as used in this clause, means that data (other than computer software) which is of a scientific or technical nature.

"Computer software", as used in this clause, means computer programs, computer data bases, and documentation thereof.

"Form, fit, and function data", as used in this clause, means data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, as well as data identifying source, size, configuration, mating and attachment characteristics, functional characteristics,

and performance requirements; except that for computer software it specifically excludes the algorithm, process, formulas, and flow charts of the software.

"Government purpose rights", as used in this clause, means rights to use, duplicate, or disclose technical data or computer software, in whole or in part and in any manner, for Government purposes only, and to have or permit others to do so for Government purposes only. Government purpose rights include purposes of competitive procurement but do not grant to the Government the right to have or permit others to use technical data or computer software for commercial purposes.

"Limited-rights data", as used in this clause, means data produced at private expense that embodies trade secrets or is commercial or financial and confidential or privileged.

"Limited rights", as used in this clause, means the rights of the Government in limited-rights data as set forth in the Limited Rights Notice of subparagraph (g)(1).

"Restricted computer software", as used in this clause, means computer software developed at private expense and that is a trade secret, is commercial or financial and confidential or privileged, or is published copyrighted computer software, including minor modifications of such computer software.

"Restricted rights", as used in this clause, means the rights of the Government in restricted computer software, as set forth in the Restricted Rights Notice of subparagraph (g)(2).

"Unlimited rights", as used in this clause, means the right to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose whatsoever, and to have or permit others to do so.

(B) Allocation of Rights

1. Except as provided in paragraph (C) below regarding copyright, the Government shall have Government purpose rights in:

- i. Data first produced in the performance of this subcontract;
- ii. Form fit and function data delivered under this subcontract;

- iii. Data delivered under this subcontract (except for restricted computer software) that constitutes manuals or instructional and training material for installation, operation, or routine maintenance and repair; and
 - iv. All other data delivered under this subcontract unless provided otherwise for limited-rights data or restricted computer software in accordance with paragraph (g) below.
2. The Subcontractor shall have the right, solely for performance under this subcontract, to:
- i. Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Subcontractor in the performance of this subcontract unless provided otherwise in paragraph (d) below;
 - ii. Protect from unauthorized disclosure and use that data which is limited-rights data or restricted computer software to the extent provided in paragraph (g) below;
 - iii. Substantiate use of, add, or correct limited- rights or restricted rights notices and to take other appropriate action, in accordance with paragraphs (e) and (f) below;
 - iv. Establish claim to copyright subsisting in data first produced in the performance of this subcontract to the extent provided in subparagraph (c)(1) below.

(C) Copyright

1. Data first produced in the performance of this subcontract. Unless provided otherwise in subparagraph (d) below, the Subcontractor shall establish claim to copyright data first produced in the performance of this subcontract. If claim to copyright is made, the Subcontractor shall affix the applicable copyright notice of 17 U.S.C. 401 or 402 to the data when such data is delivered to MountainNet, Inc., and include that notice as well as acknowledgment of Government sponsorship on the data when deposited in the U.S. Copyright Office or published. The Subcontractor shall grant to RICIS by assignment sole rights to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government, for all such data.

2. Data not first produced in the performance of this subcontract. The Subcontractor shall not, without prior written permission of MountainNet, Inc., incorporate in data delivered under this subcontract any data that is not first produced in the performance of this subcontract and that contains the copyright notice of 17 U.S.C. 401 or 402, unless the Subcontractor identifies such data and grants to the Government, or acquires on its behalf, a license of the same scope as set forth in subparagraph (1) above, provided, however, that if such data is computer software the Government shall acquire a copyright license as set forth in subparagraph (g)(2) below.
3. Removal of notices. MountainNet, Inc. agrees not to remove any copyright notices placed on data pursuant to this paragraph (c), and to include such notices on all reproductions of the data.

(D) Release, publication and use of data:

1. Except in performance of this contract, the Subcontractor shall have no right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Subcontractor in the performance of this subcontract unless either provided otherwise below in this paragraph or expressly set forth in this subcontract.
2. The Subcontractor agrees that to the extent it receives or is given access to data that is necessary for the performance of this subcontract and that contains restrictive markings, the Subcontractor shall treat the data in accordance with such markings unless otherwise specifically authorized in writing by MountainNet, Inc. or NASA Grant Officer.

(E) Unauthorized marking of data:

1. Notwithstanding any other provisions of this subcontract concerning inspection or acceptance, if any data delivered under this subcontract is marked with the notices specified in subparagraphs (g)(1) or (g)(2) below and use of such is not authorized by this clause, or if such data bears any other restrictive or limiting markings not authorized by this subcontract, the NASA Grant Officer may at any time either return the data to MountainNet, Inc. for return to the Subcontractor, or cancel or ignore the markings. However, it is understood that the NASA Grant Officer will not cancel or ignore markings unless:

- i. UHCL or the NASA Grant Officer makes written inquiry to MountainNet, Inc. or Subcontractor concerning the propriety of the markings, providing 30 days (or a shorter period of not less than 5 days from the date of receipt of such inquiry if UHCL or the NASA Grant Officer determines, in accordance with 1827.473-2(g) of the NASA-FAR Supplement, that there are exigencies justifying such shorter period) to respond; and
 - ii. There is no response within the set period (or a longer time approved by UHCL or the NASA Grant Officer for good cause shown) or the response fails to substantiate the propriety of the markings.
2. UHCL or the NASA Grant Officer shall consider the response if, and determine whether the markings shall be canceled or ignored. UHCL or the NASA Grant Officer shall furnish written notice to MountainNet, Inc. of the determination. MountainNet, Inc. shall immediately provide UHCL or the NASA Grant Officer's written notice to the Subcontractor.
 3. MountainNet, Inc. shall immediately notify the Subcontractor of any inquiry it receives from UHCL or the NASA Grant Officer concerning the propriety of a Subcontractor marking. MountainNet, Inc. shall exert its best efforts to assist the Subcontractor to make a timely response to the inquiry. However, the Subcontractor bears the burden of justifying the propriety of the questioned marking to the satisfaction of the Government.
 4. The above procedures may be modified in accordance with Government regulations implementing the Freedom of Information Act (5 U.S.C. 552), if necessary to respond to a request for data thereunder.

(F) Omitted or incorrect markings:

1. Data delivered to the Prime Contractor, to UHCL or the Government without any notice authorized by paragraph (g) below, and without a copyright notice, shall be deemed to have been furnished with unlimited rights, and MountainNet, Inc., UHCL and the Government assume no liability for the disclosure, use, or reproduction of such data. However, to the extent the data has not been disclosed without restriction outside the Government, the Subcontractor may request, within 6 months (or a longer time approved by MountainNet, Inc., UHCL or the NASA Grant Officer for good cause shown) after delivery of such data, permission to have notices placed on qualifying data at the Subcontractor's expense, and MountainNet, Inc. or the NASA Grant Officer may agree to do so if the Subcontract:

- i. Identifies the data to which the omitted notice is to be applied;
- ii. Demonstrates that the omission of the notice was inadvertent;
- iii. Establishes that the use of the proposed notice is authorized;
- iv. Acknowledge that MountainNet, Inc., UHCL and the Government have no liability with respect to the disclosure or use of any such data made prior to the addition of the notice or resulting from the omission of the notice.

2. MountainNet, Inc., UHCL or NASA Grant Officer may also:

- i. Permit correction, at the Subcontractor's expense, of incorrect notices if the Subcontractor identifies the data on which correction of the notice is to be made and demonstrates that the correct notice is authorized; or
- ii. Correct any incorrect notices.

**(G) Protection of limited-rights data
and restricted computer software:**

1. MountainNet, Inc. may require the delivery of limited-rights data under this subcontract. Limited-rights data formatted as a computer data base is to be treated as limited- rights data under this subparagraph. If delivery of such data is required, the Subcontractor may affix the following "Limited Rights Notice" to the data and MountainNet, Inc. will thereafter treat the data, subject of the provisions of paragraphs (E) and (F) above, in accordance with such notice:

Limited Rights Notice

- a. This data is submitted with limited rights under Government Cooperative Agreement No NCC9-16 between the National Aeronautics and Space Administration and the University of Houston, Clear Lake, and a subcontract thereunder between the University of Houston, Clear Lake, and MountainNet, Inc. It may be reproduced and used by MountainNet, Inc., the University of Houston, Clear Lake, and the Government with express limitation that it will not, without permission of the Subcontractor, be disclosed outside the Government; except that the Government may disclose this data

outside the Government for the following purposes, if any, provided that the Government makes such disclosure subject to prohibition against further use and disclosure;

[Insert permissible purposes for disclosure.]

- b. This notice shall be marked on any reproduction of this data, in whole or in part.

[End of notice]

- 2.i. MountainNet, Inc. may require by written request the delivery of restricted computer software. If delivery of such computer software is so required, the Subcontractor may affix the following "Restricted Rights Notice" to the computer software and MountainNet, Inc., the University of Houston, Clear Lake, and the Government will thereafter treat the computer software, subject to paragraphs (E) and (F) above, in accordance with the Notice.

Restricted Rights Notice

- (a) This computer software is submitted with restricted rights under Government Cooperative Agreement No NCC9-16 between the National Aeronautics and Space Administration and the University of Houston, Clear Lake, and a subcontract thereunder between the University of Houston and MountainNet, Inc. It may not be used, reproduced, or disclosed by the Government, the University of Houston or MountainNet, Inc., except as provided below or as otherwise expressly stated in the subcontract.
- (b) This computer software may be:
- (1) Used or copied for use in or with the computer for which it was acquired, including use at any installation to which such computer may be transferred;

- (2) Used with a backup computer if the computer for which it was acquired is inoperative;
 - (3) Reproduced for safekeeping (archives) or backup purposes;
 - (4) Modified, adapted, or combined with other computer software, provided that the modified, adapted, or combined portions of the derivative software incorporating restricted computer software shall be subject to the same restricted rights; and
 - (5) Disclosed and reproduced for use by support subcontractors or their subcontractors in accordance with subparagraphs (1) through (4) above, provided the disclosure is made subject to these restricted rights.
- (c) Notwithstanding the foregoing, if this computer software is published copyrighted computer software, it is licensed to MountainNet, Inc., the University of Houston, Clear Lake, and the Government, without disclosure prohibitions, with the minimum rights set forth in paragraph (b) above.
- (d) Any other rights shall be marked on any reproduction of this computer software, in whole or in part.

[End of notice]

- ii. Where it is impractical to include the above Notice on restricted computer software, the following short-form Notice may be used in lieu thereof:

Restricted Rights Notice (Short Form)

Use, reproduction, or disclosure is subject to restrictions set forth in Government Cooperative Agreement Number NCC9-16, Project No. RICIS No. SE. 18, between the National Aeronautics and Space Administration and the University of Houston, Clear Lake, and a subcontract thereunder between the University of Houston, Clear Lake, and MountainNet, Inc.

[End of Notice]

(H) Subcontracting.

The Subcontractor has the responsibility to obtain from its lower tier subcontractors all data and rights therein necessary to fulfill the Subcontractor's obligations under this subcontract. If a lower tier subcontractor refuses to accept terms affording MountainNet, Inc., the University of Houston, Clear Lake, and the Government such rights, the Subcontractor shall promptly bring such refusal to the attention of MountainNet, Inc. and not proceed with subcontract award without further authorization.

(I) Relationship to patents.

Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government.

ARTICLE XXIV:

AUDIT

- (a) The MountainNet, Inc. Contract Administrator, the University of Houston, Clear Lake, Contract Administrator, the Administrator of NASA, and the Comptroller General of the United States, or any of their authorized representatives, shall have access to any pertinent book, document, papers, and records of the Subcontractor and of its subrecipients to make audits, examinations, excerpts and transcripts. All of the foregoing provisions shall apply to any subrecipient performing substantive work under this subcontract.
- (b) The books of account, files and records of the Subcontractor which are applicable to this subcontract shall at all reasonable times be available for inspection, review and audit by the cognizant federal audit agency to determine the proper application and use of all funds paid to or for the account or benefit of the Subcontractor; in addition, the Subcontractor shall provide such special reports as required by MountainNet, Inc. to permit evaluation of progress on the project.
- (c) Subcontractor agrees to maintain all financial records pertinent to this agreement for a period of three years from the later of final payment under any phase of this subcontract or submission of the final report.
- (d) Upon request, the Subcontractor must provide MountainNet, Inc. with a copy of a third party annual audit report of activities under this subcontract. If this report is not available, Subcontractor will obtain the services

of an accounting firm at its expense to audit this subcontract as required by the federal Government.

- (e) Subcontractor shall reimburse to MountainNet, Inc. a sum of money equivalent to the amount of any expenditures disallowed should the funding agency or authorized agency rule through audit exception or some other appropriate means, that the expenditures from funds allocated to the Subcontractor were not made in compliance with the regulations of the funding agency or the provisions of this subcontract.

ARTICLE XXV:

(a) Definitions:

1. "*Invention*" means any invention or discovery which is or may be patentable or otherwise protectable under Title 35 of the United States Code.
2. "*Subject Invention*" means any invention of the Subcontractor conceived or first actually reduced to practice in the performance of work under this subcontract.
3. "*Practical Application*" means to manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.
4. "*Made*" when used in relation to any invention means the conception of first actual reduction to practice of such invention.
5. "*Small Business Firm*" means a domestic small business concern as defined at Section 2 of Public Law 85-536 (15 U.S.C. 632) and implementing regulations of the administration of the Small Business Administration. For the purpose of this clause, the size standards for small business concerns involved in Government procurement and subcontracting at 13 C.F.R. 121.3-8 and 13 C.F.R. 121.3-12, respectively, will be used.
6. "*Nonprofit Organization*" means a domestic university or other institution of higher education or an organization of the type described in Section

501(c)(3) of the Internal Revenue Code of 1954 [26 U.S.C. 501(c)] or any domestic nonprofit scientific or educational organization qualified under a state nonprofit organization statute.

(b) Allocation of Principal Rights.

The Subcontractor may retain the entire right, title, and interest throughout the world to each Subject Invention subject to the provisions of this clause and 35 U.S.C. 203. With respect to any Subject Invention in which the Subcontractor retains title, the federal Government shall have a non-exclusive, non-transferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States the Subject Invention throughout the world.

(c) Invention Disclosure, Election of Title and Filing of Patent Applications by Subcontractor:

1. The Subcontractor will disclose each Subject Invention to MountainNet, Inc., the University of Houston, Clear Lake, and NASA within two months after inventor discloses it in writing to Subcontractor personnel responsible for patent matters. The disclosure shall be in the form of a written report and shall identify the cooperative agreement and the subcontract under which the invention was made and the inventor(s). It shall be sufficiently complete in technical detail to convey a clear understanding, to the extent known at the time of the disclosure, of the nature, purpose, operation, and the physical, chemical, biological or electrical characteristics of the invention. The disclosure shall also identify any publication, sale or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, the Subcontractor will promptly notify MountainNet, Inc., the University of Houston, Clear Lake, and NASA of the acceptance of any manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, the Subcontractor will promptly notify MountainNet, Inc., the University of Houston, Clear Lake, and NASA of the acceptance of any manuscript describing the invention for the publication or of any sale or public use planned by the Subcontractor.
2. The Subcontractor will elect in writing whether or not to retain title to any such invention by notifying MountainNet, Inc. within twelve (12) months of

disclosure to Subcontractor personnel responsible for patent matters; provide that in any case where publication, sale or public use has initiated the one year statutory period wherein valid patent protection can still be obtained in the United States, the period for election of title may be shortened by NASA to a date that is no more than sixty (60) days prior to the end of the statutory period.

3. The Subcontractor will file its initial patent application on an elected invention within two (2) years after election or, if earlier, prior to the end of any statutory period wherein valid patent protection can be obtained in the United States after publication, on sale, or public use. The Subcontractor will file patent applications in additional countries within either ten (10) months of the corresponding initial patent application or six months from the date permission is granted by the Commissioner of Patents and Trademarks to file foreign patent applications where such filing has been prohibited by a Secrecy Order.
4. Requests for extension of the time for disclosure, election, and filing may, at the discretion of NASA, be granted.

(d) Conditions When the Government May Obtain Title. The Subcontractor will convey to NASA, upon written request, title to any Subject Invention:

1. If the Subcontractor fails to disclose or elect the Subject Invention within the times specified in (c) above, or elects not to retain title. NASA may only request title within sixty (60) days after learning of the Subcontractor's failure to report or elect within the specified times.
2. In those countries in which the Subcontractor fails to file patent applications within the time specified in (c) above; provided, however, that if the Subcontractor has filed a patent application in a country after the times specified in (c) above, but prior to its receipt of the written request of NASA, the Subcontractor shall continue to retain title in that country.
3. In any country in which the Subcontractor decided not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in reexamination or opposition proceeding on, a patent on a Subject Invention.

(e) Minimum Rights to Subcontractor:

1. The Subcontractor will retain a nonexclusive, royalty- free license throughout the world in each Subject Invention to which NASA obtains title except if the Subcontractor fails to disclose the Subject Invention within the times specified in (c), above. The Subcontractor's license extends to its domestic subsidiaries and affiliates, if any, within the corporate structure of which the Subcontractor is a party and includes the right to grant sublicenses of the same scope to the extent the Subcontractor was legally obligated to do so at the time the grant was awarded. The license is transferable only with the approval of NASA, except when transferred to the successor of that party of the Subcontractor's business to which the invention pertains.
2. The Subcontractor's domestic license may be revoked or modified by NASA to the extent necessary to achieve expeditious practical application of the Subject Invention pursuant to an application for an exclusive license submitted in accordance with applicable provisions in NASA's Patent Licensing Regulations, 14 C.F.R. 1245.2. This license will not be revoked in that field of use or the geographical areas in which the Grantee has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of NASA to the extent the Subcontractor, its licensees, or its domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.
3. Before revocation or modification of the license, NASA will furnish the Subcontractor a written notice of its intention to revoke or modify the license, and the Subcontractor will be allowed thirty (30) days (or such time as may be authorized by NASA for good cause shown by the Subcontractor) after the notice to show cause why the license should not be revoked or modified. The Subcontractor has the right to appeal in accordance with NASA Patent Licensing Regulation, 14 C.F.R. 1245.2, any decision concerning the revocation or modification of its license.

(f) Subcontractor Action To Protect the Government's Interest:

1. The Subcontractor agrees to execute or have executed and promptly deliver to MountainNet, Inc. all instruments necessary to: (i) establish or confirm the rights the Government has throughout the world in those Subject Inventions

to which Subcontractor elects to retain title; and (ii) convey title to NASA when required under (d) above, and to enable the Government to obtain patent protection throughout the world in that Subject Invention.

2. The Subcontractor agrees to require, by written agreement, its employees, other than clerical and non-technical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by the Subcontractor, each Subject Invention made under this subcontract in order that the Subcontractor can comply with the disclosure provisions of (c) above, and to execute all papers necessary to file patent applications on Subject Inventions and to establish the Government's rights in the Subject Inventions. This disclosure format should require, as a minimum, the information required by (c)(1) above. The Subcontractor shall instruct such employees through employee agreements and suitable educational programs on the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to U.S. or foregoing statutory bars.
3. The Subcontractor will notify MountainNet, Inc. and NASA of any decision not to continue the prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on a patent, in any country, not less than thirty (30) days before the expiration of the response period required by the relevant patent office.
4. The Subcontractor agrees to include, within the specification of any United States patent application and any patent issuing thereon covering a Subject Invention, the following statement: "THIS INVENTION WAS MADE WITH GOVERNMENT SUPPORT UNDER COOPERATIVE AGREEMENT NO. NCC9-16, UHCL PROJECT NO. RICIS NO. SE. 18, SUBCONTRACT NO. 2, AWARDED BY NASA AND THE UNIVERSITY OF HOUSTON, CLEAR LAKE.. THE GOVERNMENT HAS CERTAIN RIGHTS IN THIS INVENTION."
5. The Subcontractor shall furnish MountainNet, Inc.: (i) interim reports every twelve (12) months from the date of this subcontract, listing all Subject Inventions required to be disclosed during that period, or stating that there were no such Subject Inventions; (ii) a final report prior to close out of the Subcontract listing (A) all Subject Inventions or stating that there were none and (B) all subcontracts containing a patent rights clause or stating that there were none; (iii) notification of all subcontracts for experimental,

development, research, design or engineering work and identification of the patent rights clause (either the "New Technology" clause as required by NASA FAR Supplement Subpart 18-27.373(b) or the "Patent Rights" clause as required by this subcontract, and a copy of the subcontract upon request; (iv) upon request, the filing date, serial number, and title, a copy of the patent application (including an English translation when available), and a patent number and issue date for any Subject Invention in any country in which the Subcontractor has applied for patents.

(g) Subcontracts:

- (1) The Subcontractor will include this clause, suitably modified to identify the parties, in all lower-tier subcontracts, regardless of tier, for experimental, developmental, or research work to be performed by a small business firm or nonprofit organization. The lower tier subcontractor will retain all rights provided for the Subcontractor in this clause, and the Subcontractor will not, as part of the consideration for awarding the lower tier subcontract, obtain rights in the lower tier subcontractor's Subject Inventions.
- (2) The Subcontractor will include in all other lower tier subcontracts, regardless of tier, the experimental, developmental, research, design or engineering work the patent rights clause as required by NASA FAR Supplement 18-27.373(b).

(h) Reporting on Utilization of Subject Inventions.

The Subcontractor agrees to submit on request periodic reports no more frequently than annually on the utilization of a Subject Invention or on efforts at obtaining such utilization that are being made by the Subcontractor or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Subcontractor, and such other data and information as NASA may reasonably specify. The Subcontractor also agrees to provide additional reports as may be requested by NASA in connection with any march-in proceeding undertaken by NASA in accordance with paragraph (j) of this clause. To the extent data or information supplied under this section is considered by the Subcontractor, its licensee or assignee, to be privileged and confidential and is so marked, Subcontractor may submit such data or information in a sealed package to MountainNet,

Inc. and MountainNet, Inc. shall submit said package unopened to NASA under the provision in its cooperative agreement under which NASA agrees that, to the extent permitted by law, it will not disclose such information to persons outside the Government.

(i) Preference for United States Industry.

Notwithstanding any other provision of this clause, Subcontractor agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any Subject Invention in the United States unless such person agrees that any products embodying the Subject Invention or produced through the use of the Subject Invention will be manufactured substantially in the United States. However, in individual cases, the requirement for such an agreement may be waived by NASA upon a showing by the Subcontractor or its assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

(j) March-in Rights.

The Subcontractor agrees that with respect to any Subject Invention in which it has acquired title, NASA has the right in accordance with the procedures established by the NASA Procurement Regulation which are consistent with OMB Circular A-124 to require the Subcontractor, an assignee or exclusive licensee of a Subject Invention to grant a non-exclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and if the Subcontractor, assignee, or exclusive licensee refuses such a request, NASA has the right to grant such a license itself if NASA determines that: (i) such action is necessary because the Subcontractor or assignee has not taken or is not expected to take within a reasonable time, effective steps to achieve practical application of the Subject Invention in such field of use; (ii) such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the Subcontractor, assignee, or their licensees; (iii) such action is necessary to meet requirements for public use specified by federal regulations and such requirements are not reasonably satisfied by the Subcontractor, assignee, or licensees; or (iv) such action is necessary because the agreement required by paragraph (i) of this clause has not been obtained or waived or because a licensee of the exclusive right to use or sell any Subject Invention in the United States is in breach of such agreement.

(k) Special Provisions for Grants with nonprofit Organizations: If the Subcontractor is a nonprofit organization, it agrees that:

1. Rights to a Subject Invention in the United States may not be assigned without the approval of NASA, except where such assignment is made to an organization which has one of its primary functions the management of inventions and which is not, itself, engaged in or does not hold a substantial interest in other organizations engaged in the manufacture or sale of products or the use of processes that might utilize the invention or be in competition with embodiments of the invention provided that such assignee will be subject to the same provisions as the Subcontractor.
2. The Subcontractor may not grant exclusive licenses under United States patents or patent applications in Subject Inventions to persons other than small business firms for a period in excess of the earlier of (i) five years from first commercial sale or use of the invention; or (ii) eight years from the date of the exclusive license excepting that time before regulatory agencies necessary to obtain premarket clearance, unless on a case-by-case basis, NASA approves a longer exclusive license. If exclusive field of use licenses are granted, commercial sale or use in one field of use will not be deemed commercial sale or use as to other fields of use, and a first commercial sale or use with respect to a product of the invention will not be deemed to end the exclusive period to different subsequent products covered by the invention.
3. The Subcontractor will share any royalties collected on a Subject Invention with the inventor.
4. The balance of any royalties or income earned by the Subcontractor with respect to the Subject Inventions, after payment of expenses (including payments to inventors) incidental to the administration of Subject Inventions, will be utilized for the support of scientific research or education.

(1) Communications.

NASA has designated a New Technology Representative and a Patent Representative to be the central point of contact for administering this clause in accordance with the procedures of NASA FAR Supplement Subpart 18-27.373(3), which representatives are listed in Appendix A. The Subcontractor shall include such designation in all lower-tier subcontracts containing either this clause or the clause required by NASA FAR Supplement Subpart 18-27.373(b). The Subcontractor will forward a copy of all disclosures of Subject Inventions, election of rights, interim and final reports, and other reports and information required

by this clause to the NASA-Houston Installation Patent Counsel in addition to furnishing such information to the Contract Administrator.

ARTICLE XXVI:

GOVERNING LAW

The interpretation of this subcontract shall be governed by the laws of the State of Texas, United States of America. The only appropriate venue for resolution of disputes to this subcontract shall be in the State of Texas, United States of America, unless the same is a dispute solely between MountainNet, Inc., and Subcontractor (and its subcontractors, if any), in which case this subcontract shall be governed by the laws of the State of West Virginia and the only proper venue shall be in Monongalia County, State of West Virginia, United States of America.

ARTICLE XXVII:

MISCELLANEOUS PROVISIONS

- (a) This document with attached Appendices constitutes the entire agreement between the parties relative to the subject matter, and may be modified or amended only by a written agreement signed by both parties.
- (b) If one or more of the provisions of this subcontract shall be held to be invalid, illegal or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby.
- (c) Failure of either party to insist upon strict performance of any covenant or condition of this subcontract in any one or more instances shall not be construed as a waiver for the future of any such covenant or condition, but the same shall be and remain in full force and effect.
- (d) This subcontract may be executed simultaneously in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.
- (e) The captions of this subcontract are for convenience and reference only and in no way define, describe, extend, or limit the scope or intent of this agreement or the intent of any provision hereof.

- (f) This subcontract shall be binding upon and inure to the benefit of the parties and their respective successors, personal representatives, and assigns.
- (g) All nouns or pronouns and any variation thereof shall be deemed to refer to the masculine, feminine, neuter, singular, or plural, as the identify of the parties, or their personal representatives, successors and assigns may require.
- (h) Notice required to be given to NASA or the Government, the University of Houston, or any other entity shall additionally require that a copy of said notice be delivered to MountainNet, Inc.

IN WITNESS WHEREOF, the parties hereto have executed this subcontract on the day and year last specified below.

MOUNTAINNET, INC. _____

By:

By:

Title

Title

Date

Date

APPENDIX A
SCHEDULE OF DELIVERABLES

APPENDIX B

APPENDIX C
KEY PERSONNEL

Key personnel employed during contract performance are as follows:

APPENDIX D
SUBCONTRACTORS

TEAMING AGREEMENT
BETWEEN
MOUNTAINNET, INC.
AND

This agreement made and entered into this ____ day of_____, 19____, by and between MountainNet Inc., a West Virginia Corporation, having its principal office at Dellslow, West Virginia (hereinafter referred to as "MountainNet"), and _____, a _____, having its principal office at _____, hereinafter referred to as "client",

WHEREAS, MountainNet is planning a number of projects to further the awareness of the capabilities and use of Ada as a programming language; and

WHEREAS, MountainNet is a West Virginia small business corporation which has extensive experience with private networks and related services.

WHEREAS, client is a West Virginia small business providing consulting services in the use of Ada and Ada related technology to small businesses, large defense contractors, government agencies and commercial businesses,

WHEREAS, MountainNet and client desire to share these various areas of expertise in a mutually beneficial relationship; and

WHEREAS, MountainNet and client desire to establish a mechanism whereby projects related to Ada and software engineering can be identified and a mutual agreement regarding pursuit of such projects can be formalized.

NOW THEREFORE, to effectuate the foregoing, MountainNet and client, in consideration of the mutual covenants hereinafter contained, agree as follows:

1. Relationship of the Parties

Definition of teaming relationships such as Prime Contractor or Subcontractor will be dependant upon the specific requirements of each individual project under consideration and will be subject to mutual acceptance by each party. This mutual acceptance will be recorded in the form of a signed amendment to this

Agreement (Annexes), in advance to the marketing of such project. A sample Annex Format is attached to this Agreement.

2. Mutual Obligation

Each party will exert its best efforts to produce a proposal(s) which will cause the award of each specific program to the team as constituted herein.

- A. The Prime Contractor will recognize and identify the Subcontractor in its proposal and keep the Subcontractor fully advised of any change which may affect the Subcontractor's area of responsibility.
- B. During the effective term of this agreement, for opportunities specifically identified herein or by attached Annexes, the parties will team and compete together on an exclusive basis. However, except as hereafter provided, this Agreement shall not preclude either party from bidding or contracting independently from the other on any opportunity which is not identified herein or by Annex to this agreement.
- C. In the event the Prime Contractor is awarded the contract for this Program, the Prime Contractor and the Subcontractor agree to negotiate in good faith and proceed in a timely manner to execute a mutually acceptable subcontract for the work to be performed by the Subcontractor, as to be described in a Statement of Work or other description of work to be performed and attached to each Annex associated with the program being pursued.

3. Limitation of Acceptability of the Agreement

This Agreement shall apply only to the proposals related to the Programs identified herein and in each Annex and to no other effort undertaken by the Prime Contractor or the Subcontractor jointly or separately. The parties hereto shall be deemed to be independent contractors, and the employees of one shall not be deemed the employees of the other. Neither party is authorized to make commitments or representations on behalf of the other, without prior written mutual agreement, which shall be satisfied by the execution of an Annex hereto.

4. Subcontractor's Responsibility to Provide Information and Support

The Subcontractor will provide all proposal material and technical support pertinent to the work assigned in the attached Statement of Work of each Annex. The Subcontractor shall provide the Prime Contractor, as part of its cost proposal, supporting schedules in sufficient detail to permit the Prime Contractor's evaluation. However, the Subcontractor will not be required to disclose indirect rates to the Prime Contractor. Cost format and Work Breakdown Structure shall be specified by the Prime Contractor. If requested by the Prime Contractor, the Subcontractor will assure the availability of management and technical personnel to assist the Prime Contractor in any discussions and negotiations with the client. In this regard, during the negotiations the Subcontractor will be fully advised of all issues effecting or having the potential to effect the Subcontractor's price and/or proposed work, and will be given every opportunity prior to completion of negotiations to provide additional data as necessary in support of the proposed price and/or Statement of Work.

5. Anticipated Subcontract Content

Without restricting the terms and conditions of the subcontract, the contemplated subcontract will contain provisions passing down those terms and conditions of the prime contract which must be passed on to the Subcontractor in order to comply with such prime contract. The subcontract will be negotiated at a fair and reasonable price(s) established after cost or price analysis. Further, price consideration for the work to be performed will be based on the Subcontractor's proposal and negotiations with the client. It is understood between the Prime Contractor and the Subcontractor that any such subcontractor may be subject to the approval of the client, regardless of the provisions hereof.

6. Limitation of Right to Reimbursement, Payment or Compensation

Each party to this Agreement will bear the respective costs, risks, and liabilities incurred by it as a result of its obligations and efforts under this Agreement. Therefore, neither the Prime Contractor or the Subcontractor shall have any right to any reimbursement, payment, or compensation of any kind from each other during the period prior to the award and execution of any resulting subcontract between the Prime Contractor and the Subcontractor for the Program and work described in this Agreement.

7. Recruitment

It is expressly agreed and understood that neither party will solicit personnel of the other party who are engaged in the pursuit of this Program for the purpose of inducing them to join their employ during the course of this Agreement and any resultant subcontract hereunder and for a period of one (1) year after termination thereof.

8. Limitations of Use of Data and Information

- A.** The parties anticipate that under this Agreement it may be necessary for either party to transfer to the other information of a proprietary nature. Proprietary information shall be clearly identified in writing by the disclosing party at the time of disclosure. Oral disclosure, when necessary, shall be clearly identified as proprietary at the time of the disclosure and shall be reduced to writing within 30 days.
- B.** Each of the parties agrees that it will use the same reasonable efforts to protect such information as are used to protect its own proprietary information. Disclosures of such information shall be restricted to those individuals who are directly participating in the proposal and subcontract efforts identified herein.
- C.** Neither party shall make any reproduction, disclosure, or use of such proprietary information except as follows:
 - 1. Such data furnished by the Subcontractor may be used by the Prime Contractor in performing its obligations under this Agreement.
 - 2. Such data furnished by the Prime Contractor may be used by the Subcontractor in performing its obligations under this Agreement.
 - 3. Such data may be used in accordance with any written authorization received from the disclosing party.
- D.** The limitations on reproduction, disclosure, or use of proprietary information shall not apply to, and neither party shall be liable for reproduction, disclosure, or use of proprietary information with respect to which any of the following conditions exist:
 - 1. If the information has been developed independently by the party receiving it, or has been lawfully received from other sources, provided

such other source did not receive it due to a breach of this Agreement or any other agreement.

2. If the information is published by the party furnishing it or is disclosed by the party furnishing it to others, without restriction, or it has been lawfully obtained by the party receiving it from other sources, or if such information otherwise comes within the public knowledge or becomes generally known to the public by lawful means, not in breach of any agreement.
3. If any part of the proprietary information has been or hereafter shall be disclosed in a United States patent or copyright issued to the party furnishing the proprietary information hereunder, after the issuance of said patent. The limitations on such proprietary information as is disclosed in the patent shall be only that afforded by the United States Patent or Copyright Laws.

- E. Neither the execution and delivery of this Agreement, nor the furnishing of any proprietary information by either party shall be construed as granting to the other party, either expressly, by implication, estoppel, or otherwise, any license under any invention or patent, hereafter owned or controlled by the party furnishing same.
- F. Notwithstanding the expiration of the other portions of this Agreement, the obligations and provisions of this paragraph 8 shall continue for a period of twenty-four (24) months from the date on which such information is transferred, without regard to the then effective status of this Agreement otherwise.
- G. Each party will designate one or more individuals within its organization as the only point(s) for receiving proprietary or confidential information exchanged between the parties pursuant to this Agreement.
- H. Unless otherwise specifically agreed, proprietary information shall be returned to the furnishing party at the expiration of the project for which it was provided, or at the termination of the need therefore, whichever shall first occur.

9. Rights in Inventions

Inventions shall remain the property of the originating party. In the event of joint inventions, the parties shall establish their respective rights by negotiations

between them. In this regard, it is recognized and agreed that the parties may be required to and shall grant licenses or other rights to the Client to inventions, data, and information under such standard provisions which may be contained in the prime contract contemplated by this Agreement, provided, however, such license or other rights shall not exceed those required by said contract.

10. Public Release of Information

Neither party shall issue a news release, public announcement, advertisement, or any other form of publicity concerning his efforts in connection with this Agreement without obtaining prior written approval of such release, announcement, etc., from the other party. In the event such approval is granted, any resulting form of publicity shall give full consideration to the role and contributions of both parties, and shall accurately reflect the Prime Contractor/Subcontractor identifies and relationship of and between the parties.

11. Designation of Responsible Individuals

All communications relating to this Agreement shall be directed to the specific person designated to represent the Prime Contractor and the Subcontractor on this Program. Each of the parties to this Agreement shall appoint one technical and one contractual representative (which may be the same person). These appointments shall be kept current during the period of this Agreement. Communications which are not properly directed to the persons designated to represent the Prime Contractor and the Subcontractor shall not be binding upon the Prime Contractor or the Subcontractor. Provided, however that material mailed to the address of such representative(s) shall be considered binding ten (10) days after the mailing thereof, or upon receipt, whichever shall first occur.

The technical and contractual representatives appointed for this Agreement are as follows:

A. FOR MOUNTAINNET INC.:

Technical

James W. Rautner
Vice President
MountainNet, Inc.
P.O. Box 370
Dellslow, WV 26531-0370
(304) 296-1458

Contractual

R. Michael Digman
President
MountainNet, Inc.
P.O. Box 370
Dellslow, WV 26531-0370
(304) 296-1458

B. FOR client:

Technical

Contractual

12. Expiration of Agreement

This Agreement, which is effective upon the date of its execution, shall automatically expire and be deemed terminated effective upon the date of the happening or occurrence of any one of the following events or conditions, whichever shall first occur; except for the conditions expressed in Paragraphs 7 and 8 hereof:

A. Mutual agreement between the parties.

B. Notification in writing, by either party, to the other not less than thirty (30) days prior to the effective date of the desired termination.

C. The expiration of a two (2) year period commencing on the date of this Agreement except as such period may be extended by mutual agreement of the parties.

13. Expiration of Amendments (Annexes)

Each Amendment (Annex) to the Agreement is effective upon the date of its execution shall automatically expire and be deemed terminated effective upon the date of the happening or occurrence of any of the following events or conditions, whichever shall first occur; except as otherwise provided in this Agreement:

A. Official client announcement or notice of the cancellation of the specific program being pursued.

B. The receipt by the Prime Contractor of written notice from the client that it will not award to it the contract for the specific program being pursued.

C. The receipt of written notice from the client that it has awarded the contract for the specific program to someone other than the Prime Contractor.

D. The receipt of official client notice that the proposed Subcontractor will not be approved as a subcontractor under a contract to the Prime Contractor on the specific program, or that substantial areas of the Subcontractor's proposed responsibility have been eliminated from the requirements.

E. Award of a subcontract by the Prime Contractor to the Subcontractor for its designated portion of the specific program.

F. The occurrence of any of the events specified in Paragraph 12 herein.

14. Assignment

This Agreement may not be assigned or otherwise transferred by either party, in whole or in part, without the express prior written consent of the other party.

15. Limitations on the Nature of the Agreement

This Teaming Agreement does not constitute or create a joint venture, pooling arrangement, partnership, or formal business organization of any kind, and the rights and obligations of the parties shall be only those expressly set forth herein. Neither party shall have authority to bind the other except to the extent authorized herein. Nothing herein shall be construed as providing for the sharing of profits or losses arising out of the efforts of any of the parties.

16. Applicability of State Law

This Agreement shall be governed by and interpreted under the laws of the State of West Virginia.

17. Scope of the Agreement

This Agreement contains the entire agreement of the parties and cancels and supercedes any previous understanding. All changes or modifications to this Agreement must be agreed to in writing between the parties.

In the event that any term or provision of this agreement is for any reason found by any competent entity or court of law to be illegal or otherwise unenforcible, such term or provision shall be stricken, and the remainder of this agreement shall continue in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed in duplicate, each of which shall be considered an original, by their respective signatory officials thereunto duly authorized, as of the day and year first above written.

MountainNet, Inc.:

By:

Title

Date

By:

Title

Date

SAMPLE ANNEX

Project 1:

Name

SYNOPSIS:

The objective of this proposal is to:

MountainNet/client Relationship:

Acceptance of Project:

By:

Title

Date

By:

Title

Date

AdaNET
Electronic Mail Service and Document Transfer
User Registration Form

Please type your information at the "---->"

1. Name, address, telephone:

Person's Name: ---->

Organization: ---->

Address (#1): ---->

Address (#2): ---->

City and State: ---->

Zipcode: ---->

Primary Telephone Number: ---->

Alternate: ---->

FAX Number: ---->

(Continued on next page)

2. Network ID's (e.g.: BITNET: VM5521 @ WVNVM, DIALCOM, COMPUSERVE, etc)

Preferred AdaNET userid: --->
DDN userid: --->
NASA Mail userid: --->
BITNET userid/node: --->
DIALCOM userid: --->
COMPUSERVE userid: --->
SOURCE userid info: --->
MPL userid: --->
other (specify): --->

3. From what location will you normally be accessing AdaNET?

4. What device will you be using to access AdaNET (e.g., *IBM-PC, Televideo 924 video terminal, etc*) ? Please be specific as to the manufacturer and model number.

5. What type of telephone modem do you have connected to the device listed in #4 above? Please be specific as to the manufacturer and model number.

Thank you. Please return this questionnaire to:

AdaNET
c/o MountainNet, Inc.
Attn. Mr. Michael Digman
P. O. Box 370
Dellslow, WV 26531

6.1 Internal Documents

6.1.1 Summary

The following comprise the list of forms used internally for any project and/or activity center operated under the auspices of MountainNet, Inc., Eastgate Plaza, Second Floor, P. O. Box 370, Dellslow, WV 26531.

MTNET-101/88: CASH EXPENSE REPORT This form is for use by employees only to report out-of-pocket expenses incurred in carrying out business, whether in travel or day to day operations. Each item reported should be accompanied by a dated receipt. Once it is filed with the Coordinator, it will require the routine approval method before payment can be made.

MTNET-102/88: CONSULTANT EXPENSE INVOICE This form is for use by consultants under personal service contracts to MountainNet, Inc., regardless of Activity Center/Code. Requires routine approval method.

MTNET-103/88: TRAVEL REQUEST FORM This form is for use once a project/company team member has been informed of impending travel. It should be filed as far in advance as possible to allow for adequate coordination. Requires routine approval method.

MTNET-104/88: PURCHASE AUTHORIZATION FORM This form is to be used when any purchases are to be made for any area of the business. Small office supplies used in daily operations are the only exception to this form. Once filed, routine approval is required before purchase. The timeliness and execution of the request is left to the discretion of the President of MountainNet, who is the final signature required. Every effort will be made to provide prompt service on critical items needed for project continuation.

MTNET-105/88: REQUEST FOR CONTRACTED SERVICES FORM This form is used when the services of an outside consultant/contractor is required on a one-time only basis. Routine approval required.

MTNET-106/88: TRAVEL/CONFERENCE REPORT This form is to be completed after business related travel or conference attendance. This form is the final step in documenting business/conference related travel.

CASH EXPENSE REPORT (EMPLOYEE)

MTNET 101/88

MountainNet, Inc.

NAME: _____ DATE: _____

Activity Center/Code _____ CASH ADVANCE _____

TRIP NUMBER: _____

ITINERARY: _____

EXPENDITURES

03 C1 - AdaNET Project/NASA 03 C2 - MV8 Timeshare Serv.
03 C3 - Telecommunications Serv. 03 C4 - Venture Center Serv.
03 C5 - Hardware Facilities Mngmt. 03 C6 - AdaNET/Unspons.

DATE	ITEM	AMOUNT
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

TOTAL AMOUNT OF THIS EXPENSE REPORT	_____
LESS ADVANCE (if any)	_____
AMOUNT OF REIMBURSEMENT	_____

Submitted _____ Date _____

APPROVED: _____

Contract Administrator Date

APPROVED: _____

Project Director (if applicable) Date

APPROVED: MountainNet, Inc.

By: _____

R. Michael Digman, Pres.

MTNET 102/88

CONSULTANT EXPENSE INVOICE
MountainNet, Inc.

NAME: _____

Date

MONTH: _____

INV.#

ACTIVITY CENTER/CODE: _____

(if submitting an invoice for more than one Activity
Center, please use a separate form for each one.)

03 C1 - AdaNET Project/NASA 03 C2 - MV8 Timeshare Serv.
03 C3 - Telecommunications Serv. 03 C4 - Venture Center Serv.
03 C5 - Hardware Facility Serv. 03 C6 - AdaNET/Unsponsored

DATE

ITEM

AMOUNT

TOTAL AMOUNT OF THIS INVOICE _____

APPROVAL FOR PAYMENT:

APPROVED: _____

Contract Administrator

Date

APPROVED: _____

Project Director

Date

APPROVED: MountainNet, Inc.

BY: _____

R. Michael Dignan, Pres. Date

REMARKS:

TRAVEL REQUEST FORM

MTNET 103/88

MountainNet, Inc.

 |||||

NAME: ----- DATE: -----

Itinerary: -----

(Name of conference/reason for travel, destination, etc.)

03 C1 - AdaNET Project/NASA 03 C2 - MV8 Timeshare Services
 03 C3 - Telecommunications Serv. 03 C4 - Venture Center Serv.
 03 C5 - Hardware Facility Mgmt. 03 C6 - AdaNET Project/Unspons.

Activity Center/Code:-----

LODGING REQUIRED: Dates:-----thru-----No. of nights:---

TRANSPORTATION REQUIRED:

Rental Car: ----- Pref. -----

Airlines: ----- Pref. -----

Departure time/day preferred: -----

Arrival time/day back pref: -----

Cash Advance required: -----

Conference/Registration Fee: -----

(amount/to whom payable)

Requested by: -----

(signature)

Date

APPROVED: -----

Contract Administrator

Date

APPROVED: -----

Project Director

Date

APPROVED: MountainNet, Inc.

By: -----

R. Michael Digman, Pres.

Date

MTNET 104/88

MountainNet, Inc.

.....

03 C1 - AdaNET Project/NASA

03 C2 - MV8 Timeshare Serv.

03 C3 - Telecommunications Serv.

03 C4 - Venture Center Serv.

03 C5 - Hardware Facility Mgmt.

03 C6 - AdaNET/Unspons.

Description of Item:

PURCHASING INFO:

(cost, part number, etc.)

SUPPLIER:**ADDRESS/PHONE:**

Activity Center/Code: _____

PERSON MAKING REQUEST:

Signature

Date _____

APPROVED:

Contract Administrator

Date _____

APPROVED:

Project Dir./Coordinator (if appl.) Date

APPROVED:

MountainNet, Inc.

By:

R. Michael Dugman, Pres.

Date

P.O. #:

PROPOSAL FOR CONTRACTED SERVICES

MTNET 105/88

MountainNet, Inc.

03 C1 - AdaNET Project/NASA	03 C2 - MV8 Timeshare Serv.
03 C3 - Telecommunications Serv.	03 C4 - Venture Center Serv.
03 C5 - Hardware Facility Serv.	03 C6 - AdaNET Project/Unsp.

PROPOSED TO: _____/_____

Company

Act. Center/code

DESCRIPTION OF _____

PROPOSED SERVICE: _____

SELECTED
CONTRACTOR/
CONSULTANT: _____

CONSULTANT/
CONTRACTOR RATE: _____

(rate)

(per hour, job, etc.)

NUMBER OF JOB
UNITS REQUIRED: _____

(Enter N/A if proposed
service is by job)

(hours, days, etc.)

SUBMITTED: _____

Signature

Date

Approved: _____

Contract Administrator (if applicable)

Date

Approved: _____

Project director/coordinator (if applicable) Date

Approved: _____

MountainNet, Inc.

By: _____

R. Michael Digman, President

Date

Amount approved:
not

_____ Total for above services

to exceed this amount.

TRAVEL/CONFERENCE REPORT FORM

MTNET 106/88

MountainNet, Inc.

|||||

NAME: ----- Date: -----

TRAVEL/CONFERENCE: -----

BRIEF SYNOPSIS: (please list dates of travel and brief outline of activity)

Conference Proceedings/manuals: -----

list titles of books if any

Submitted to Librarian: -----

Date

Chapter 7

Acronyms

7.1 List of Acronyms

A list of acronyms used by the AdaNET project:

ABS	AdaNET Bibliographic System
ACE	Ada Center of Excellence
ACM	Association for Computing Machinery
ADAM	Automated Data Manipulation
ADE	Ada Development Environment
AFATDS	Advanced Field Artillery Data System
AdaIC	Ada Information Clearinghouse
AIRMICS	Army Institute for Research in Management Information, Communication and Computer Science
AIS	AdaNET Information Services
AJPO	Ada Joint Program Office
ALS/N	Ada Language System/Navy
AOS/VS	Advanced Operating System/ Virtual System
ANSI	American National Standards Institute
ASR	SIMTEL-20 Ada Software Repository
ATC	Air Traffic Control
ATSE	Army Test Program Set Support Environment
AWHMS	Aircraft Wire Harness Manufacturing System
CALS	Computer-aided Acquisition and Logistics System
CAMP	Common Ada Missile Packages
CBT	Computer Based Training

CD-ROM	Compact Disk - Read Only Memory
CIM	Computerized Integrated Manufacturing
COSMIC	Computer Software Management Information Center
COTS	Commercial-off-the-shelf
DA	Department of the Army
DAPSE	Distributed Ada Programming Support Environment
DASD	Direct Access Storage Device
DBMS	Database Management System
DCDS/Ada	Distributed Computing Design System/Ada version
DDN	Defense Data Network
DEC	Digital Equipment Corporation
DET	Design Evaluation Tool
DG	Data General
DID	Data Item Description
DOC	Department of Commerce
DOC OPTI	Department of Commerce Office of Productivity, Technology and Innovation
DoD	Department of Defense
DSI	Dynamic Software Inventory
DTD	Document Type Description
EA/RA	Entity Attribute/Relation Attribute
ESA	European Space Agency
FAA	Federal Aviation Administration
FCIM	Flexible Computerized Integrated Manufacturing
FTE	Full Time Equivalent
GRACE	Generic Reusable Ada Components for Engineering
IRD	International Resource Development, Incorporated
IRDS	Information Resource Dictionary System
ISEC	Information Systems Engineering Command
ISF	Industrial Space Facility
JSC	Johnson Space Center
MAFIS	Mobile Automated Field Instrumentation System
MIMS	Mobile Information Management System
MIS	Management Information Systems
MOU	Memorandum of Understanding
NASA	National Aeronautics and Space Administration
NASA TU	National Aeronautics and Space Administration Technology Utilization
NASA TUNS	National Aeronautics and Space Administration Technology Utilization Network System

NATO	National Atlantic Treaty Organization
NBS	National Bureau of Standards
NIAC	NASA Industrial Applications Center
NOSC	Naval Ocean Systems Command
NRL	Naval Research Lab
NSF	National Science Foundation
NTT	Nippon Telegraph-Telephone
ODISC4	Office of the Directorate for Information Systems for Command, Control, Communications and Computers
OSI	Open Systems Interconnect
OPTI	Office of Productivity, Technology and Innovation
RAPID	Reusable Ada Packages for Information Systems Development
RDBMS	Relational Database Management System
RICIS	Research Institute for Computing and Information Systems
SDI	Strategic Defense Initiative
SE	Software Engineering
SEAD	Software Engineering and Ada Database
SEI	Software Engineering Institute
SERC@UHCL	Software Engineering Research Center at University of Houston Clear Lake City
SFC	Space Flight Center
SGML	Standard Generalized Markup Language
SIG	Special Interest Group
SIGAda	ACM Special Interest Group on Ada
SMAP	Software Management Assurance Program
SPAWAR	Space and Naval Warfare Systems Command
SPC	Software Productivity Consortium
SOW	Statement of Work
SQL	Structured Query Language
SSE	Software Support Environment
STARS	Software Technologies for Adaptable, Reliable Systems
SVC	Software Valley Corporation
TCP/IP	Transmission Control Protocol/ Internet Protocol
TCSEC	Trusted Computer System Evaluation Criteria
TU	See NASA TU
UHCL	University of Houston at Clear Lake City
VMS	Virtual Memory System
WIS	WWMCCS Information System

WORM
WVNET
WWMCCS

Write Once/ Read Many
West Virginia Network for Educational Telecomputing
Worldwide Military Command & Control System

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